



CURIN

Chitkara University
Research & Innovation
Network

RES NOVAE

CURIN Research and Development News

Vol. 2021, Issue 4
R&D Activities
During Oct - Dec 2021

COVER STORY

Chitkara University bagged

2nd Rank in ARIIA

Research and innovation activities of CURIN
immensely contributed to this achievement

ARIIA

**Atal Ranking of Institutions on
Innovation Achievements**

TOP STORIES

- Achievements of CURIN faculty members in the 4th Annual Excellence Awards of the University.
- Chitkara University Doctoral Consortium (CUDC 2021) conducted, 534 submissions received.
- 55 SCI and Scopus indexed publications, 59 patents filed by CURIN
- Hackathons, Workshops to promote innovations and the spirit of entrepreneurship
- Awards and recognition for CURIN faculty members in external forums.

CONTENTS

| | |
|--|----|
| Chitkara University Secured 2 nd Rank in ARIIA | 1 |
| 4 th Annual Excellence Awards Function of Chitkara University | 3 |
| Research @CURIN | 5 |
| Chitkara University Doctoral Consortium - CUDC 2021 | 9 |
| Patent Filed by CURIN Faculty Members and Scholars | 11 |
| Idea-Thon Organized by Chitkara University NewGen IEDC | 18 |
| Awards | 20 |
| Insights- Smart Drug Delivery System | 21 |
| Faculty Development Program on Entrepreneurship | 22 |
| CURIN Faculty Members Invited as Resource Persons in Multiple Events | 24 |
| Hands-on Workshops Conducted | 26 |
| List of Publications | 27 |

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Special Mention

Dr. Varun Chhabra (Associate Professor, CURIN) for proof reading the issue

Ms. Harsimrat Kaur (Assistant Manager, CURIN) for compiling the issue

**EXPLORE
YOUR
POTENTIAL**

Chitkara University Secured 2nd Rank in ARIIA

Research, Innovation and Development activities of CURIN have immensely contributed to this achievement

Chitkara University, Punjab achieved a landmark by securing 2nd Rank in the third edition of prestigious Atal Ranking of Institutions on Innovation Achievements 2021 (ARIIA 2021) in December 2021. ARIIA is a joint initiative of Ministry of Education, Government of India and the All India Council for Technical Education (AICTE) to systematically rank all major higher educational institutions in India on indicators like infrastructure to support innovation, IPR, pre-incubation, incubation, start-up and entrepreneurship development amongst students and faculty. Chitkara University Research and Innovation Network (CURIN) is one of major driving forces in prompting all the research and innovation activities at the university.

Chitkara University is now recognized as Band A institution in the category titled 'University and Deemed to be a University (Private Self-funded)'. A total of 1438 educational institutions including all the IITs, NITs etc. participated in ARIIA 2021.



On this remarkable achievement, Dr. Ashok K Chitkara (Chancellor, Chitkara University) congratulated the students and the faculty members, and he said "It is the hard-work of our students, staff and faculty that resulted in securing this achievement. Chitkara University's Research and Innovation Network (CURIN) encourages our students to become innovative leaders and contribute to nation-building by developing indigenous solutions. Moreover, the university has a well-defined research promotion policy which has resulted in the development of state-of-the-art advanced facilities."



Dr. Madhu Chitkara (Pro-Chancellor, Chitkara University) remarked that this milestone is an outcome of Chitkara University's relentless focus on fostering innovation, and encouraging students to solve real-world problems. It speaks volumes of our innovative teaching methodology, academic prowess and proactive industry collaborations.

Dr. Archana Mantri (Vice Chancellor, Chitkara University) highlighted the importance of CURIN when she said "We are delighted to share CURIN has multi-disciplinary advanced facilities supported by research funding from government agencies such as DST, DRDO, etc. to the tune of 37.24 crores. The research scholars and faculties are provided seed money for undertaking research and filing patents. Various dynamic collaborations have been established through the internationally-funded research projects, international conferences and cultural immersion across the campus."

ARIIA was launched in 2019 and it evaluates universities based on the parameters including activities to promote and support innovation and start-ups on campus, incubation infrastructures, successful commercialization of innovations, investment, collaboration, and partnerships with ecosystem enablers, research outputs, publications and intellectual property generated and technology transfer.

Chitkara University has already incubated more than 130 start-ups, filed close to 1500 patents, commercialized around 40 technologies, and published more than 2400 research papers in leading conferences and journals.

4 Star Rating by the Institution's Innovation Council

Chitkara University, Punjab accomplished a yet another milestone by achieving highest rating of 4 Star in the Annual Performance University Category awarded by the Institution's Innovation Council (IIC) for the year 2021-22. Ministry of Education has established a Ministry of Education Innovation Cell (MIC) that works closely with Higher Education Institutions (HEIs) to promote innovation, start-ups and entrepreneurship culture amongst students. MIC has established IICs in selected HEIs. The annual performance result announcement of IICs was virtually held on December 1, 2021. The Chief Guest of the event was Prof. Dr. Anil D. Sahasrabudhe, Chairman, AICTE and the Guest of Honour was Prof. Dr. Rajneesh Jain, Secretary, UGC.



4th Annual Excellence Awards Function of Chitkara University

CURIN faculty members received top awards and incentives
Total cash incentives worth INR 1.37 crores awarded

Chitkara University is well known for its strong focus on achieving research excellence, and the university both encourages and rewards faculty members for doing meaningful and applied research. Every year Chitkara University organizes an Excellence Awards Function to recognize and reward all those faculty members of the university who have published quality research papers in some of the top journals, bagged government funded projects, secured consultancy projects from industry, filed patents etc.

On December 18, 2021, the 4th edition of the Annual Excellence Awards Function of Chitkara University was organized, and 327 faculty members of the university won a total cash incentives worth INR 1.37 Crores in five different categories. These categories were Best Researcher Award, Most Funded Researcher Award, Best Innovator Award, Best Industry Consultant Award and Best PhD Supervisor Award.

Dr. Ashok K. Chitkara (Chancellor, Chitkara University), Dr. Madhu Chitkara (Pro-Chancellor, Chitkara University) graced the Awards Function with their kind presence. The guests of honour of the Awards Function were the eminent researchers from the leading government institutions including Dr. Gowrishankar (Director, IISER, Mohali), Dr. Satish Kumar (Chairman, Armament Research Board, DRDO) and Dr. Mohit Gambhir (Director, Innovation, Ministry of Education's Innovation Cell, New Delhi). The function was organized under the expert guidance of Dr. Archana Mantri (Vice Chancellor, Chitkara University, Punjab).



Dignitaries (from L-to-R) Dr. Madhu Chitkara, Dr. Satish Kumar, Dr. Ashok K. Chitkara, Dr. Gowrishankar, Dr. Mohit Gambhir and Dr. Archana Mantri

In the Best Researcher Award Category, the Top 10 list featured three researchers from CURIN – Dr. Rahul Pandey, Dr. Jaya Madan and Dr. Shalli Rani. The criteria for selection was the number of research publications in a year and H-index. It is noteworthy that, Chitkara University has published 903 research papers in the year 2021, against 592 that were published in 2020. Our university has published more than 2400 research papers till date in leading journals and conferences.

The Most Funded Researcher Award Category featured 9 researchers from CURIN in the list of Top 10. These researchers were Dr. Nitin Saluja, Dr. Adarsh Aggarwal, Dr. S.N. Panda, Dr. Naveen Kumar, Dr. Neeraj Kumar, Dr. Sudesh K. Mittal, Dr. K. R. Ramkumar, Dr. Amanpreet Kaur and Mr. Sagar Juneja.

Dr. Nitin Saluja – Associate Director, CURIN was the winner of the Most Funded Researcher Award. Chitkara University has bagged research funding of INR 15 Crores in the year 2021. The total extramural funding received by the university since 2015 is INR 44 Crores.

The Best Innovator Category was based on the number of patents filed by the faculty members of the university in a year. Four researchers from CURIN featured in the list of Top 10 for this award. These researchers were Dr. Bhanu Sharma, Dr. Shalli Rani, Dr. S.N. Panda and Dr. Varsha Singh. A total of 578 patents were filed in the year 2021 and a total of 130 patents have been granted to the university so far.

The award for Best Consulting Assignment was based on the total amount paid by the industry for consultancy projects to the faculty members in a year. Dr. Rajnish Sharma from CURIN won this award, and Dr. S.N. Panda from CURIN also featured in the Top 10 list. Our university bagged consultancy projects worth INR 1.2 Crores in 2021.

Finally in the Best PhD Supervisor Award Category, Dr. Shalli Rani from CURIN featured in the list of Top 10.



The Excellence Awards 2021 witnessed a tight competition among the faculty members from different departments of the university for Top Positions. Faculty members from CURIN featured in the Top 10 lists of all the five award categories, and two of the awards had winners from CURIN.

The guests of honour in unison congratulated Chitkara University for not only doing meaningful research that is actually making a difference in the society, but also for conducting events like Excellence Awards, where researchers get recognition for their efforts.

Research@CURIN

High Impact Research Papers Published by CURIN during October-December 2021

Faculty members and research scholars from CURIN publish high-quality research articles in top peer-reviewed journals and conferences. In this section of the newsletter, we select five highly impactful research papers from CURIN and attempt to discuss them in the form of short summaries or articles.

The research papers, discussed in this issue are the ones that were published during October- December 2021.

A complete list of publications by CURIN faculty members and scholars during this period is available in a separate section.

Deep Neural Networks to Enhance the Resolution and Accuracy in Face Recognition Images

By: Dr. Sachin Ahuja, Director, Research

This article is based on the research paper titled “Impact of Applying Super Resolution to Low Resolution Face Images on the Performance of Deep Neural Networks” published by Dr. Sachin Ahuja from Chitkara University, Punjab in IOP journal entitled Journal of Physics.

Remote surveillance has become an integral part of our daily life, but the biggest challenge of remote surveillance is still to capture clear images in unconstrained environment. Mostly the surveillance is done using face images. Face images captured in an unconstrained environment differ in various aspects such as expression, illumination, resolution, occlusion, pose etc. In recent times, the focus of this research area has been shifted towards developing automatic robust face recognition techniques that overcome the said challenges and achieve high accuracy in face recognition.

Most of the developed automatic techniques rely on machine learning and deep learning models. Deep learning models achieve better results when compared to traditional machine learning methods. To enhance the accuracy of deep learning models in face recognition, a hybrid technique is developed that uses super resolution process, which can be applied to any deep learning model. The face images captured by the camera from a distance have low resolution and are lacking many fine details that make face recognition a challenging task. Super resolution (SR) is a process of generating high resolution (HR) images from one or more images.

To achieve this, we created a dataset with face images captured in unconstrained environment. Later we designed a CNN model with eight layers and trained on the created dataset. The deep learning model with low memory requirement and fewer parameters, achieves an accuracy of 99.75% on the test dataset and outperforms fine-tuned VGGFace by a small margin. The performance of deep neural network and fine-tuned VGGFace was observed on low resolution images, pre and post-super resolution. The deep neural network-based model available in OpenCV, SRGAN super resolution model and INTER_CUBIC interpolation are used to generate HR images. The HR images generated by OpenCV, SRGAN are better than INTER_CUBIC interpolation. The results show that HR images generated by applying SR to low resolution face images improve the image quality in terms of Mean squared error (MSE), Structural similarity index measure (SSIM) and Peak to signal noise ratio (PSNR).

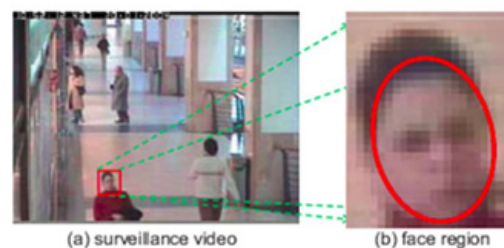


Figure 1. A typical frame from a surveillance.

The illustration is borrowed from the published paper

Detection of Disease in Tomato Leaf using Artificial Intelligence

By: Dr. Nitin Goyal, Associate Professor, CURIN

This article is based on the research paper titled “Early Detection and Classification of Tomato Leaf Disease Using High-Performance Deep Neural Network” published by Dr. Naresh Trivedi, Dr. Abhineet Anand, and Dr. Nitin Goyal from Chitkara University, Punjab in MDPI journal entitled Sensors.

Plants are definitely an integral part of our lives because they produce food and also shield us from dangerous radiation. Tomato is a food-rich plant, a consumable vegetable that is widely cultivated. Tomatoes differ in quantity depending on how they are fertilized. Worldwide, there are approximately 160 million tons of tomatoes consumed annually. Tomato, a significant contributor to reducing poverty, is seen as an income source for farm households. Tomato is not only nutrient-dense, but it also possesses pharmacological properties that protect against diseases such as hypertension, hepatitis, and gingival bleeding. According to statistics, small farmers produce more than 80% of agricultural output; due to diseases and pests, about 50% of their crops are lost. The diseases and parasitic insects are the key factors impacting tomato growth, making it necessary to research the field crop disease diagnosis.

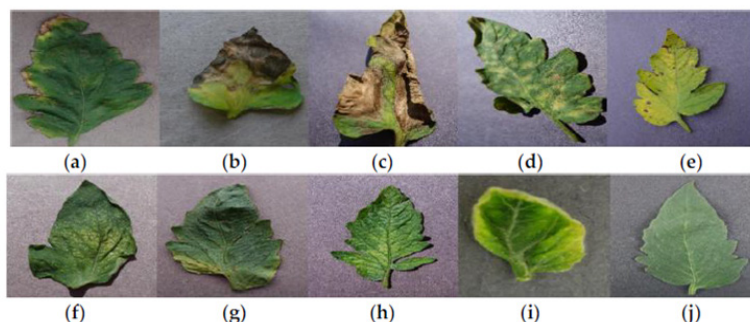


Figure 1. Sample leaf image with disease and pathogen for (a) Bacterial_Spot(*Xanthomonas vesicatoria*), (b) Early_Blight(fungus *Alternaria solani*), (c) Late_Blight(*Phytophthora infestans*), (d) Leaf_Mold(*Cladosporium fulvum*), (e) Septoria_Leaf_Spot(fungus *Septoria lycopersici*), (f) Spider_Mites(*floridana*), (g) Target_Spot(fungus *Corynespora*), (h) Tomato_Mosaic_Virus(*Tobamovirus*), (i) Tomato_Yellow_Leaf_Curl_Virus(genus *Begomovirus*), (j) Healthy_Leaf.

The illustration is borrowed from the published paper

An early and accurate diagnosis helps decrease the risk of ecological damage. Without a systematic disease identification, product quality and quantity suffer. Agricultural production must expand by 70% by 2050 to meet global food demands, according to the United Nations Food and Agriculture Organization (FAO). On the contrary, chemicals are used to prevent diseases, such as fungicides and bactericides, which negatively impact the agricultural ecosystem. There is a possibility that farmers can misclassify a disease, and an incorrect treatment will damage the plant. Similarly, field visits by domain specialists are expensive. There is a need for the development of automated disease detection and classification methods based on images that can take the role of the domain expert.

It is necessary to tackle the leaf disease with an appropriate solution. Leaf disease is the primary factor impacting the amount and quality of crop yield. As per past research, 80–90% of diseases of plants appear on leaves. The motive of work is to support farmers in identifying early-stage diseases accurately and informing them about these diseases. Early detection can reduce processing costs, reduce the environmental impact of chemical inputs, and minimize loss risk. The Convolutional Neural Network (CNN) is used to effectively define and classify tomato diseases. Google Colab is used to conduct the complete experiment with a dataset containing 3000 images of tomato leaves affected by nine different diseases and a healthy leaf. The complete process is described:

Firstly, the input images are preprocessed, and the targeted area of images is segmented from the original images.

Secondly, the images are further processed with varying hyper-parameters of the CNN model. Finally, CNN extracts other characteristics from pictures like colors, texture, edges, etc. The findings demonstrate that the proposed model predictions are 98.49% accurate.

Fabrication of Polymer Dispersed Liquid Crystals to Achieve Uniformity of Initial Vertical Alignment

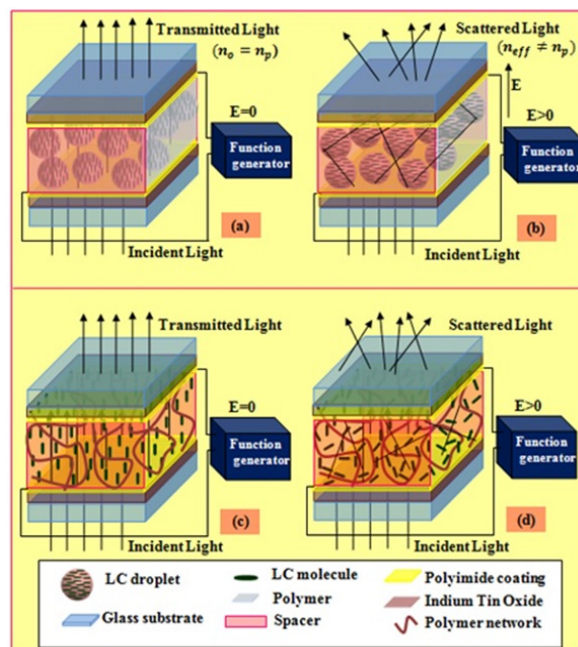
By: Dr. Vandna Sharma, Assistant Professor, CURIN

This article is based on the research paper titled “Simultaneous Effects of External Stimuli on Preparation and Performance Parameters of Normally Transparent Reverse Mode Polymer Dispersed Liquid Crystals - A Review” published by Dr. Vandna Sharma, and Dr. Pankaj Kumar from Chitkara University, Punjab in Springer journal entitled Journal of Materials Science.

The research in liquid crystal (LC) is going on for the three decades and it is playing an important role in modern technology. New applications are developed and still are in high demand, applications range from optical displays to smart devices such as lenses, micro-robots, flexible devices, smart windows, optical bandpass filters, and active phase modulators etc. Amongst, LC display devices are most successful in LC industries because of their thin profile, low power consumption,

and manufacturing cost. Later, these LC materials were used with the integration of polymers to form the polymer-dispersed liquid crystal (PDLCs) devices which can be operational in two modes such as normally scattering and normally transparent, without any requirement of polarizer and analyzer. PDLCs have wonderful applications in smart windows and energy-efficient devices. For PDLCs, the primary consideration for composing the essential LCs–polymer combination is based on the matching of the refractive index of LC to polymer refractive index. Consequently, the different approaches demonstrated in the present article considering especially normally transparent reverse mode PDLCs enrich the research domain. Despite of advancements in this area, the article focuses on the challenges to fabricate LC-polymer hybrid materials, as to achieve uniformity of initial vertical alignment (VA) of LCs inside the droplets without using any alignment layer or surface treatment on the substrates.

The researchers are also working on green re-modelling projects, and focusing on research as well as product development to improve the performance of old windows and curtain walls using PDLC films. The hybrid PDLC mixtures with the inclusion of guest host particles like nanoparticles, quantum dots, dichroic dyes, photochromic materials may reduce their threshold and operating voltages. It is also anticipated that the features like simple preparation, cost-efficiency, environment friendly and flexibility in the normally transparent reverse mode PDLCs will be encouraging in the future to promote and develop the next-generation green re-modelling energy-efficient material for their large-scale production. Such promising themes would accelerate their applications in daily life and for their use in numerous applications, like, smart windows of office buildings, displays, wearable devices and sensors etc. Additionally, the reported research work has also been extended for applications in photonics, sensors, functional devices and microlens, etc., via organized ordered structures of LC droplets in reverse mode PDLCs. As well, related research in this area is in progress and future investigations would certainly broaden technological advancements in basic and applied research using these novel anisotropic LC and polymeric materials.



The illustration is borrowed from the published paper

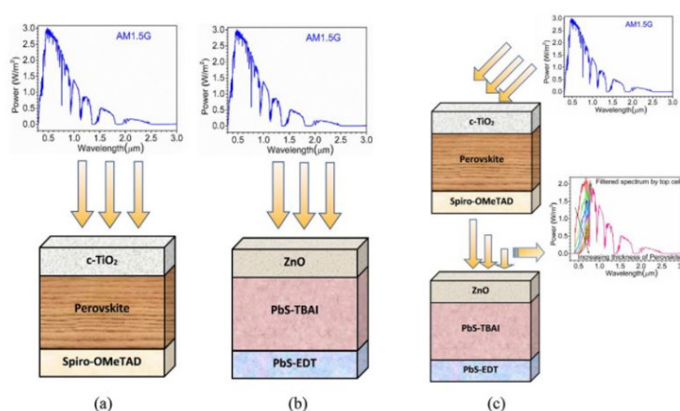
High Efficiency Tandem Solar Cell for Low-Cost Applications

By: Savita-PhD Scholar and JRF, VLSI CoE, CURIN

This article is based on the research paper “Comprehensive Device Simulation of 23.36% Efficient Two-Terminal Perovskite-PbS CQD Tandem Solar Cell for Low-Cost Applications” published by Dr. Jaya Madan, Dr. Rahul Pandey and Karanveer Singh, from Chitkara University, Punjab in Nature Journal entitled Scientific Reports.

To achieve the golden triangle elements (efficiency, cost, and lifetime), the researchers are extensively working on different semiconductor materials to develop high-efficiency solar cells. However, the single-junction solar cell suffers mainly from two inherent major power loss mechanisms, viz. thermalization, and transmission (transparent E_g or non-absorbed photon) losses. Tandem cells tackle with both thermalizations as well as transmission photon loss, which contributes mainly to the reduction of PCE of single-junction solar cells.

A research team in VLSI Centre of Excellence, Chitkara University comprising of Dr. Jaya Madan, Dr. Rahul Pandey, and Karanveer Singh have proposed 23.36% efficient, two-terminal perovskite-PbS CQD monolithic tandem solar cell through comprehensive device simulations. In this article, the performance of perovskite top cells has been optimized in terms of variation in optical properties, thickness, and interface defect density under standalone conditions. Thereafter, filtered spectrum



The illustration is borrowed from the published paper

and associated integrated filtered power by the top cell at different perovskite thickness from 50 to 500 nm is obtained to conceive the presence of the top cell above the bottom cell with different perovskite thickness. The current matching by concurrently varying the thickness of both the top and bottom sub-cell has also been done to obtain the maximum deliverable tandem JSC for the device under consideration. The top/bottom sub-cell with current matched JSC of 16.68 mA.cm⁻²/16.62 mA.cm⁻² showed the conversion efficiency of 14.60%/9.07% under tandem configuration with an optimized thickness of 143 nm/470 nm, where the top cell is simulated under AM1.5G spectrum, and the bottom cell is exposed to the spectrum filtered by 143 nm thick top cell. Further, the voltages at equal current points are added together to generate tandem J–V characteristics. This work concludes a 23.36% efficient perovskite-PbS CQD tandem design with 1.79V (VOC), 16.67 mA.cm⁻² (JSC) and 78.3% (FF). The perovskite-PbS CQD tandem device proposed in this work may pave the way for the development of high-efficiency tandem solar cells for low-cost applications.

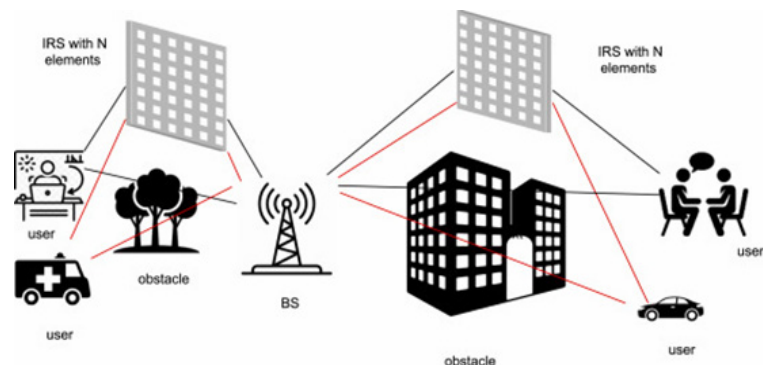
Technology to Enable Energy Efficient and Sustainable Green Wireless Communication through Intelligent Reflecting Surfaces

By: Dr. Ashu Taneja, Assistant Professor, CURIN

This article is based on the research paper titled “An Optimized Scheme for Energy Efficient Wireless Communication via Intelligent Reflecting Surfaces” published by Dr. Shalli Rani and Dr. Ashu Taneja from Chitkara University, Punjab in Elsevier journal entitled Expert Systems with Applications.

The technological advancements of future wireless networks including a massive multi-input multi-output (MIMO), millimeter wave (mmWave) communication, and heterogeneous networks (HetNets), offer huge benefits of increased data rates and spectral efficiency (SE). But the hardware complexity and increasing energy consumption are the main challenges of these technologies. The usage of separate radio frequency (RF) chain per antenna element in massive MIMO system led to high power and cost overhead. The increasing energy consumption in a wireless network is a major concern owing to a large number of circuit components in the transceiver chain.

This article proposes a practical communication scenario that helps to achieve sustainable green communication with the use of Intelligent reflecting surfaces (IRSs). IRSs are considered as a promising candidate enabling technology for future green wireless communication. Such intelligent surfaces have real-time reconfigurable properties that beam form the signal to a desired destination. IRSs consist of low cost, passive, small reflecting elements in which each element introduces different phase shifts into the incident waves by means of a controller. The incident waves can be made to propagate or beam form in the direction of the desired destination by adjusting the phase shifts induced by all elements of the IRS. This way the challenge of unfavorable propagation environment is overcome and system performance is improved with enhanced signal quality. The IRS-assisted communication scenario is evaluated for maximum data rate and maximum energy efficiency with minimum transmit power. The impact of increasing the number of reflecting elements on the trade-off between EE and achievable rates is also discussed. The optimization in energy efficient communication makes the proposed work beneficial for the real time applications.



The illustration has been borrowed from the published paper

It is common to experience the signal drop and poor quality of communication in spite of the progress in the telecommunication domain. The fast battery drainage is another challenge. To provide reliable network coverage to the remote user-facing health emergencies is very important. The introduction of IRS in the medical emergency applications (intelligent transport system, ambulance-based patient tracking system, emergency support system) is a new initiative in the smart healthcare regime. IRS-assisted communication systems offer a smart radio propagation environment that can be controlled through the use of small, low-cost and passive reflecting elements. It offers huge energy savings and thus enables sustainable energy-efficient infrastructure. The dominant line-of-sight (LoS) channels extend the network coverage and offer reliable communication to cell-edge users. A number of benefits can be availed by the significant collaboration and cooperation of various IRSs mounted on high-rise buildings, unmanned aerial vehicles (UAVs) or drones. Enabling a seamless communication networks, IRS assisted communication systems find applications in telemedicine and tele-surgery for the real-time assessment of patient. The information about the accident site or medical emergency user is conveyed to the control room of the hospital which assists the timely arrival of an ambulance at the site with the help of IRS communication.

Chitkara University Doctoral Consortium - CUDC 2021

Nine different domains of research | 400 Research scholars participated | 534 papers received

Chitkara University Research and Innovation Network (CURIN) organized Chitkara University Doctoral Consortium 2021 (CUDC 2021) during November 12-13, 2021. It was a virtual platform for exchanging scientific ideas, and sensitizing young scholars about the latest trends in their research fields. It also provided an opportunity to young scholars to present their ongoing doctoral research work, meet diverse set of academicians and industry professionals, and get feedback for future research directions.

The consortium was inaugurated by Dr. Madhu Chitkara (Pro-Chancellor, Chitkara University) with her Inaugural Address. Dr. Archana Mantri, Vice-Chancellor, Chitkara University shared the vision and objectives of CUDC, and the Directors of CUDC 2021 - Dr. Pankaj Kumar (Professor and Dean, PhD Programme) and Dr. Amit Mittal (Professor

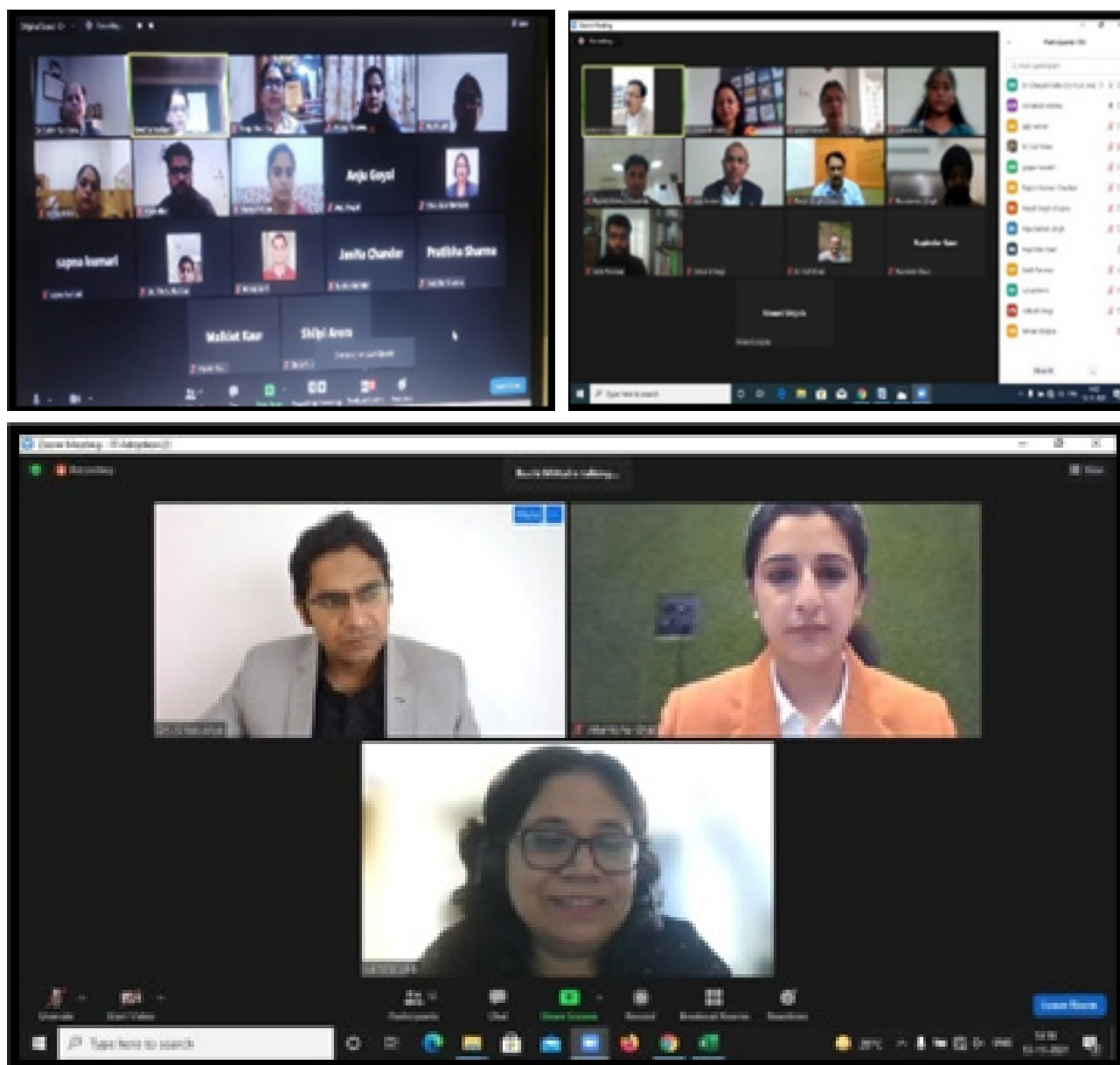


and Dean, Doctoral Research Centre) gave insights into various aspects of this edition of the CUDC. This was followed by keynote talk on the Importance of Research in Industry by Dr. A. S. Subramaniyan, Managing Director & CEO, Siemens Bangladesh Limited (SBL).

CUDC-2021 covered nine different areas namely – Engineering, Technology and Applied Sciences; Management, Commerce and Economics; Education; Media and Communication Studies; Pharmaceutical Sciences; Health Sciences - Allied, Optometry, and Physiotherapy; Recent Advances in Nursing Practice and Education; Architecture and Built Environment; Art and Design; Aesthetics and Humanities. More than 400 research scholars participated, and submitted 534 research papers in the consortium. All the accepted papers upon rigorous peer review and oral presentations in CUDC 2021 have been submitted to highly reputed Electrochemical Society Transactions (ECST) Conference Proceedings for publication. ECST Conference Proceedings published by IOP Science is Scopus Indexed having H-index of 52.

Thirty-three different sessions were organized for oral and poster presentations in the consortium and two invited talks on topics 'Smart Technical Writing through Mendeley' by Dr. Ritika Wason, Associate Professor, Bharti Vidyapeeth, Delhi and 'Using Nvivo: A Hands-on Approach' by Dr. A.K. Chauhan, Visiting Professor, Chitkara University & CEO Research Siksha, New Delhi were also conducted.

CUDC 2021 was convened by Dr. Deepali Gupta - Professor, CURIN, Dr. Meenakshi Dhiman - Associate Professor, CURIN, Dr. Urvashi Tandon and Dr. Deepika Jhamb - Associate Professors, Doctoral Research Centre, Chitkara Business School (CBS).



Patents Filed by CURIN Members and Scholars

59 Patents Filed by CURIN during October-December 2021

A total of 204 Patents (including industrial designs) have been filed by different departments of Chitkara University during October- December 2021, out of which 59 have been filed by CURIN faculty members and researchers. The details of these 59 patents are given below -

| Sr. No. | Title | Inventor | Application No. |
|---------|---|--|-----------------|
| 1. | A PROCESS FOR SYNTHESIS OF GRAPHENE OXIDE QUANTUM DOTS | Gaytri, Partha Khanra, Pankaj Kumar, Mohit Kapoor, Jyotsna Kaushal | 202111056079 |
| 2. | A WOUND HYDRATING COMPOSITION FOR TOPICAL APPLICATION AND METHOD OF PREPARATION THEREOF | Varsha Singh | 202111054784 |
| 3. | ANTITHEFT VOICE BASED DRIVER ASSISTANCE SYSTEM AND METHOD THEREOF | Umesh Kumar Lilhore, Sarita Simaiya, Meenu Khurana, Amandeep Kaur, Ajay Kumar Bharti, Anad Ranjan, Shilpi Harnal, Jasminder Sandhu, Anju Bhandari Gandhi, Poonam Panwar | 202111046991 |
| 4. | APPARATUS AND METHOD FOR DETECTION OF MEDICAL ABNORMALITIES USING X-RAY IMAGES | Raj Gaurang Tiwari, Sonu Goel, Vikas Khullar, Ajay Kumar, Ambuj Kumar Agarwal, Surya Narayan Panda, Simranjeet Singh, Keerti Bhusan Pradhan | 202111048597 |
| 5. | AUTOMATED FIRE DETECTION AND CONTROLLING SYSTEM | Umesh Kumar Lilhore, Sarita Simaiya, Amandeep Kaur, Rakesh Ahuja, Jyoti Snehi, Shilpi Harnal, Jasminder Sandhu, Anshu Singla, Chetna Kaushal, Advin Manhar, Mohammed Bakhtawar Ahmed | 202111054284 |
| 6. | AUTOMATIC WINDOW SHADE | Meenu Khurana, Sachin Ahuja, Amandeep Kaur, Bhanu Sharma, Kamali Singla, Deepali Gupta, Sachendra Singh Chauhan | 202111044987 |
| 7. | CLEANING & SANITIZING ROBOT | Rubina Dutta, Sandeep Kumar, Ravi Gupta, Jasminder Kaur Sandhu, Shivani Inder Chopra | 202111055441 |
| 8. | CONVERTIBLE APPARATUS | Simranjeet Singh, Surya Narayan Panda, Rajesh Kumar Kaushal, Naveen Kumar, Siba Kumar Udgata, Prabin Kumar Panigrahi, | 202111050308 |
| 9. | DEVICE AND METHOD FOR CALCULATING USAGE BASED TOLL FEE | Sivaram Ponnusamy, Sachin Ahuja, Jasminder Kaur Sandhu, Hitakshi Dutta, Abhineet Anand, Nandhagopal Sm, Md Abdul Wassay | 202111046750 |

| | | | |
|-----|--|--|--------------|
| 10. | DEVICE FOR CONTROLLING ELEVATOR AND METHOD THEREOF | Shalli Rani, Himanshi Babbar, Ankita | 202111056204 |
| 11. | DEVICE TO MONITOR QUALITY OF FRUITS AND VEGETABLES | Vikas Khullar, Raj Gaurang Tiwari, Ambuj Kumar Agarwal, Sachin Ahuja | 202111044986 |
| 12. | DIAMOND-LIKE CARBON DIELECTRIC BASED GRAPHENE TFET | Preeti Sharma, Jaya Madan, Rahul Pandey, Rajnish Sharma | 202111051113 |
| 13. | GAS LEAKAGE DETECTION SYSTEM AND METHOD THEREOF | Umesh Kumar Lilhore, Sarita Simaiya, Meenu Khurana, Ashok Kumar, Rakesh Ahuja, Anupam Baliyan, Atul Garg, Shilpi Harnal, Jasminder Sandhu, Vikas Lamba | 202111056562 |
| 14. | INTELLIGENT FAULT DETECTION SYSTEM AND METHOD THEREOF | P.K. Parthasarthy, Narinderpal Singh, Amanpreet Kaur, Bhanu Sharma, Archana Mantri | 202111046752 |
| 15. | LPG LEVEL DETECTION AND AUTOMATED BOOKING SYSTEM | Pooja Mahajan, Appurav Gupta, Jayti Garg, D.P. Gupta | 202111055735 |
| 16. | PARCEL DELIVERY SYSTEM USING UNMANNED AERIAL VEHICLE AND METHOD THEREOF | Umesh Kumar Lilhore, Sarita Simaiya, Amandeep Kaur, Sachin Ahuja, Leeladhar Chourasiya, Pinaki Ghosh, Jasminder Sandhu, Himanshu Pandey, Shilpi Harnal, Naresh Trivedi | 202111051349 |
| 17. | PORTABLE FOOTREST ASSEMBLY FOR TABLE | Sonam Mittal, Soni Singh, Shagun Sharma, Taniya Hasija, K.R. Ramkumar, Jeevan Singh Dosad, Ashwani | 202111056970 |
| 18. | POWER SAVING SYSTEM FOR OPERATING MACHINE AND METHOD THEREOF | Sarita Simaiya, Umesh Kumar Lilhore, Amandeep Kaur, Sachin Ahuja, Meenu Khurana, Advin Manhar, Sameera Khan, Pinaki Ghosh, Jasminder Sandhu, Shilpi Harnal | 202111049806 |
| 19. | ROBUST AND REAL-TIME AUGMENTED REALITY-BASED DRIVING ASSISTIVE SYSTEM | Gurjinder Singh, Archana Mantri, Nitin Kumar Saluja, Narinder Pal Singh, Debarshi Ghosh, Ashwani Singh, Lekha Rani | 202111056565 |
| 20. | SYNTHESIZATION OF MAGNETIC NANOPARTICLES FOR WASTE WATER TREATMENT | Meenakshi Dhiman, Partha Khanra, Baljinder Kaur | 202111047993 |
| 21. | SYSTEM AND METHOD FOR AUTOMATIC DETECTION OF DEFECTS IN MANUFACTURING PRODUCT | Umesh Kumar Lilhore, Sarita Simaiya, Vandana Mohindru Sood, Jasminder Sandhu, Suniti Purbey, Poonam Mishra, Meena Pundir, Rajwinder Kaur, Amandeep Kaur, Shilpi Harnal | 202111061882 |
| 22. | SYSTEM AND METHOD FOR CHECKING CORONAVIRUS VACCINATION STATUS | Swapandeep Kaur, Rubina Dutta, Priyanka Malhotra, Jasminder Kaur Sandhu, Amanpreet Sandhu | 202111050036 |
| 23. | SYSTEM AND METHOD FOR SCREENING AND AUTOMATIC DIAGNOSIS OF DIABETIC FOOT DISEASE | Ambuj Kumar Agarwal, Surya Narayan Panda, Vikas Khullar, Raj Gaurang Tiwari, Sonu Goel | 202111056078 |
| 24. | WEARABLE ACCESSORY CONVERTIBLE INTO UMBRELLA | Shalli Rani, Ankita, Himanshi Babbar | 202111056080 |
| 25. | WHEEL CHAIR MOBILITY SYSTEM FOR HANDICAPPED HUMANS | Umesh Kumar Lilhore, Sarita Simaiya, Sachin Ahuja, Meenu Khurana, Amandeep Kaur, Jasminder Sandhu, Advin Manhar, Mohammed Bakhtawar Ahmed, Shilpi Harnal, Jyoti Snehi | 202111053353 |

INDUSTRIAL DESIGN REGISTRATIONS

ADJUSTABLE/PORTABLE BUCKET

By: *Amandeep Singh, Priya Jindal, Jasmine Kaur, Sandhir Sharma, Sachin Ahuja, Ansh Jindal, Jeevan Singh Dosad*

Application No. - 351518-001



ADVANCED RODENT METABOLIC CAGE FOR URINE ANALYSIS

By: *Thakur Gurjeet Singh, Gaamine Preet Singh, Onkar Bedi, Shareen Singh, Nitin Kumar Saluja, Gurjinder Singh, Ashwani Singh, Rouble Gupta, Varinder Singh, Rashpinder Kaur*

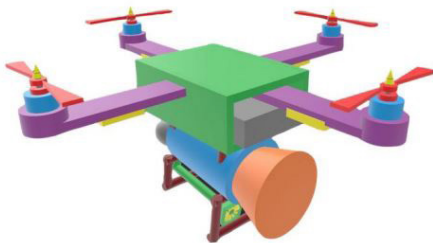
Application No. 353689-001



AERIAL SYSTEM FOR EXTINGUISHING FIRE

By: *Bhanu Sharma, Archana Mantri, Ashwani Singh, Deepika Sharma, Nitin Goyal, Amandeep Kaur, Meenu Khurana, Harbani Sharma, Krishan Dutt Sharma, Reetu Malhotra, Ridhima Rani*

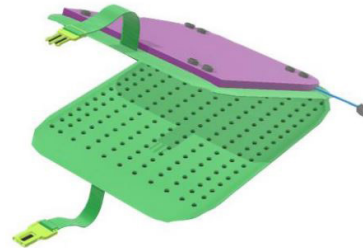
Application No. 353317-001



ANTI THEFT LAPTOP COVER

By: *Sumit Agarwal, Priya Jindal, Jasmine Kaur, Sandhir Sharma, Sachin Ahuja, Ansh Jindal, Ashwani Singh*

Application No. 352923-001



AUTOMATIC SHAKER

By: *Bhavna Sareen, Aditi Modgill, Arrik Khanna, Divya Gupta, Shivani Wadhwa, Amanpreet Kaur, Taniya Hasija*

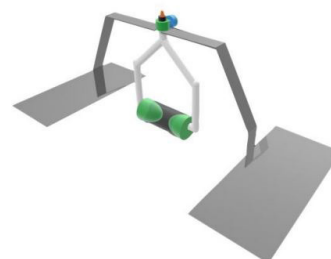
Application No. 352878-001



BALLOON BASED APPARATUS FOR INDUCTION OF CEREBRAL ISCHEMIA INJURY

By: *Thakur Gurjeet Singh, Gaamine Preet Singh, Manish Kumar, Nitin Kumar Saluja, Gurjinder Singh, Ashwani Singh, Rouble Gupta, Debarshi Ghosh, Rashpinder Kaur, Jasminder Sandhu*

Application No. 353687-001



BIKE LUGGAGE CARRIER

By: Priya Jindal, Jasmine Kaur, Sandhir Sharma, Sachin Ahuja, Ansh Jindal, Jeevan Singh Dosad, Ashwani Singh

Application No. 350639-001



ELECTRICAL UPHOLSTERY CLEANER

By: Anjali Xess, Vatsala Anand, Ruchi Sharma, Parambir Singh, Jeevan Singh Dosad

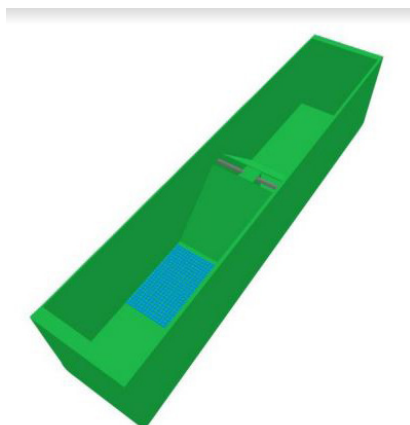
Application No. 350830-001



ELEVATED SHOCK AVOIDANCE APPARATUS FOR EVALUATION OF ANTI-PSYCHOTIC BEHAVIOUR IN RATS

By: Thakur Gurjeet Singh, Gaamine Preet Singh, Ashi Mannan, Komal Thapa, Nitin Kumar Saluja, Gurjinder Singh, Ashwani Singh

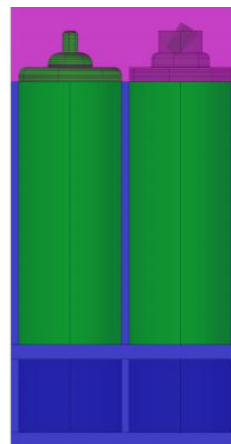
Application No. 354976-001



FEEDING BOTTLE CUM STORAGE BOX

By: Nitish Arora, Tanvi Jindal, Reena Malik, Manni Kumar, Gaurav Katoch, Prateek Srivastava

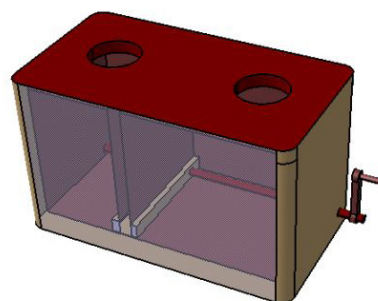
Application No. 355612-001



FLEXIBLE PARTITIONED DUSTBIN

By: Sachendra Singh Chauhan, Deepak Thakur, Tanya Gera, Jaiteg Singh, Meenu Khurana, Sachin Ahuja

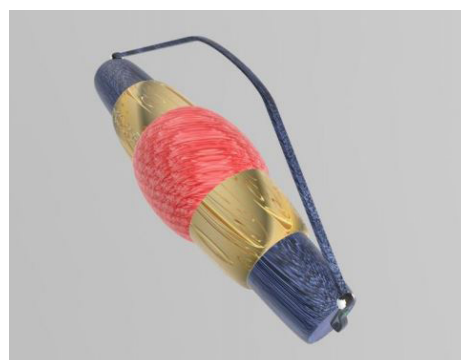
Application No. 354554-001



FOLDABLE BAG

By: Jasmine Kaur, Priya Jindal, Sandhir Sharma, Sachin Ahuja, Ansh Jindal, Ashwani Singh, Jeevan Singh Dosad

Application No. 350638-001



HEATING BASED TWO-WAY SHOCK AVOIDANCE APPARATUS

By: *Thakur Gurjeet Singh, Gaamine Preet Singh, Ashi Mannan, Komal Thapa, Nitin Kumar Saluja, Gurjinder Singh, Ashwani Singh*

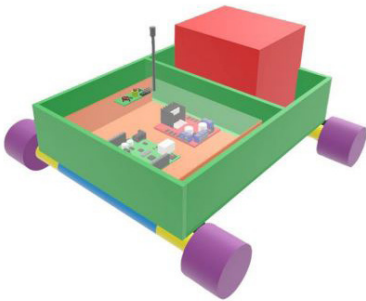
Application No. 354988-001



LANE PRINTING ROBOT

By: *Ashwani Singh, Bhanu Sharma, Nitin Goyal, Jasminder Sandhu, Deepam Goyal, Prateek Srivastava, Neeraj Singla, Mohit Rana, Shreya Garg, Harbani Sharma, Akshita Sharma, D. P. Gupta, Lovish Matta*

Application No. - 353875-001



MILLI SAMPLE CRUCIBLE

By: *Vandna Sharma, Pankaj Kumar, Ridhima Gahrotra, Ankit Rai Dogra*

Application No. 354989-001



MULTIPURPOSE BOX

By: *Kamali Gupta, Deepali Gupta, Mani Madhukar, Sheifali Gupta, Ramneet, Mudita, Nitin Goyal, Sapna Juneja, Gifty Gupta, Jotesh Gupta*

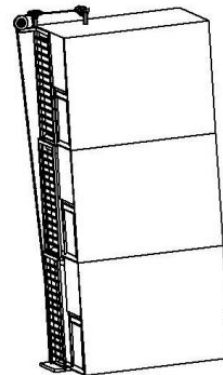
Application No. 354087-001



MULTILEVEL STAIRS FOR EMERGENCY EXIT

By: *Surya Narayan Panda, Sachin Ahuja, Simranjeet Singh, Prabin Kumar Panigrahi, Tejinder Kaur*

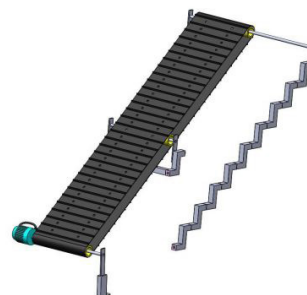
Application No. 352280-001



MULTIPURPOSE LIFT FOR THE STAIRCASE

By: *Naveen Kumar, Rajesh Kumar Kaushal, Surya Narayan Panda, Simranjeet Singh, Manish Sharma, Rajat, Jaswinder Singh*

Application No. 354765-001



NANO PORTABLE INTENSIVE CARE UNIT

By: Surya Narayan Panda, Simranjeet Singh, Tahir Mehmood, Sachin Ahuja, Manish Sharma, Prabin Kumar Panigrahi, Seema Verma, Rajesh Kumar Kaushal, Naveen Kumar

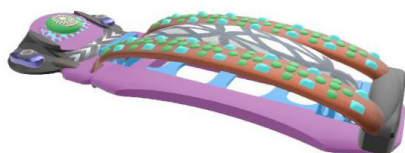
Application No. 352279-001



NECK AND BACK PAIN RELIEVER & BACKBONE STRAIGHTENER

By: Priya Jindal, Jasmine Kaur, Sandhir Sharma, Amandeep Singh, Sachin Ahuja, Ansh Jindal, Jeevan Singh Dosad

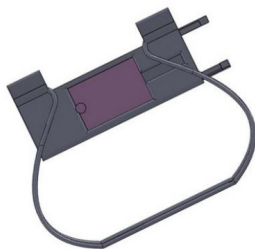
Application No. 351248-001



PAPER CLIP CUM CAMERA SHUTTER FOR LAPTOPS AND SMARTPHONES

By: Rajesh Kumar Kaushal, Naveen Kumar, Simranjeet Singh, Surya Narayan Panda, Prabin Kumar, Manish Sharma, Jaspreet Singh Bajaj, Ambuj Kumar Agarwal, Gurpreet Kaur

Application No. 351251-001



TWAIN CHAIR

By: Tanya Gera, Deepak Thakur, Sachendra Singh Chauhan, Jaiteg Singh, Meenu Khurana, Vivek Bhardwaj, Sachin Ahuja

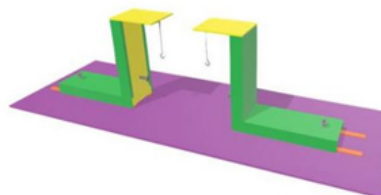
Application No. 354760-001



PULLEY BASED APPARATUS FOR INDUCTION OF CEREBRAL ISCHEMIA INJURY

By: Thakur Gurjeet Singh, Gaamine Preet Singh, Heena Khan, Amanjot Kaur, Nitin Kumar Saluja, Gurjinder Singh, Ashwani Singh, Rouble Gupta, Varinder Singh, Rashpinder Kaur

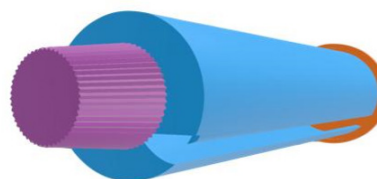
Application No. 353686-001



SACHET SQUEEZER

By: Ridhima Gahrotra, Pankaj Kumar, Vandna Sharma, Ankit Rai Dogra

Application No. 353320-001



SLIDING PANEL COVERAGE FOR MINI TRUCK AND MAJOR TRUCK

By: Priya Jindal, Jasmine Kaur, Sandhir Sharma, Sachin Ahuja, Ansh Jindal, Jeevan Singh Dosad, Ashwani Singh

Application No. 350637-001



SMART BOOKS READING STAND

By: Reetu Malhotra, Deepak Kumar, Naveen Kumar, Bhanu Sharma

Application No. 353408-001



SMART RODENT CAGE

By: *Thakur Gurjeet Singh, Gaamine Preet Singh, Amit Kumar, Ashi Mannan, Nitin Kumar Saluja, Gurjinder Singh, Ashwani Singh, Rouble Gupta, Varinder Singh, Debarshi Ghosh, Jasminder Sandhu*



SMART WATCH FITTED WITH EMERGENCY MEDICATION

By: *Kalpna Guleria, Simranjeet Singh, Sushil Kumar, Surya Narayan Panda*

Application No. 350831-001



SMART FACIAL MASSAGER

By: *Taniya, Amanpreet Kaur, Shagun Sharma, K.R. Ramkumar, Aditi Modgill*

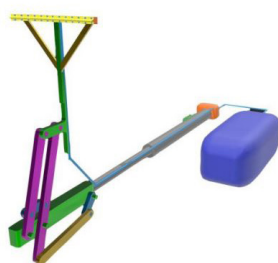
Application No. 351520-001



SOLAR PANEL CLEANER

By: *Ashwani Singh, Jeevan Singh, Nitin Kumar Saluja, Gurjinder Singh, Rouble Gupta, Debarshi Ghosh, Varinder Singh, Rashpinder Kaur, Jasminder Kaur Sandhu*

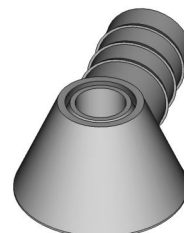
Application No. 353321-001



SPLASH PROTECTION SYSTEM FOR CAMERA

By: *Devendra Prasad, Vikrant Sharma, Samriti Thakur, Meenu Khurana, Basant Kumar Verma, Kalpna Guleria, Sunny Singh, Afshan Hassan, Isha Kansal, Renu Popli*

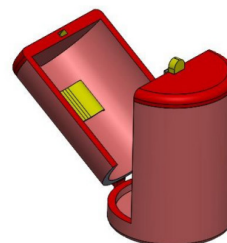
Application No. 350640-001



TIFFIN BOX

By: *Manoj Gaur, Chinky Jaggi, Pankaj Kumar*

Application No. 354540-001



TIPPED BOTTOM VIAL

By: *Vandna Sharma, Pankaj Kumar, Ridhima Gahrotra, Ankit Rai Dogra*

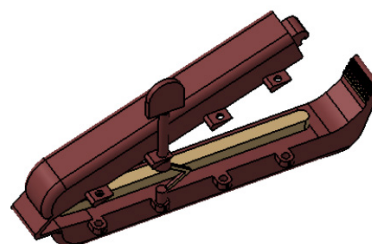
Application No. 355947-001



TUBE SQUEEZER

By: *Deepak Thakur, Tanya Gera, Sachendra Singh Chauhan, Jaiteg Singh, Meenu Khurana, Vivek Bhardwaj, Ankit Bansal, Sachin Ahuja*

Application No. 354550-001



Idea-Thon Organized by Chitkara University NewGen IEDC

Top 10 teams received prototyping funding for building their ideas

CURIN organized Idea-Thon that provided a platform for students to bring forth their most innovative ideas that have good commercial potential, and win prototyping funding for developing those ideas. The other key objective of the competition was to nurture students' ideas and bring them to a level where they can be pitched for prototyping funding from NewGen IEDC.

The theme of the competition was 'PROPEL YOUR INNOVATIVE IDEAS INTO FASCINATING REALITY' and it was launched on October 1, 2021 and by the last date of submission (i.e. Oct 25) we received as many as 50 ideas from students of different departments of the university. These ideas were received in the form of 1-minute video where applicants explained their problem statement, proposed solutions and commercial potential of their ideas.



38 ideas were shortlisted, and these applicants were provided mentoring support by the experts from the university in the Brainstorming round of the competition. The Brainstorming round was held between November 10-25.

After the brainstorming round 26 teams were shortlisted that presented their final project pitches for funding support from NewGen IEDC to external jury that comprised of seasoned professionals in the domain of innovation and entrepreneurship. These experts were – Dr H.K.Mittal - Former Adviser, Ministry of Science & Technology,

NSTEDB, DST, Govt. of India; Dr Jagdish Lal Raheja - Former Chief Scientist and Group Head, CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani, Rajasthan; and Mr. Brijesh Aggarwal - Serial Entrepreneur Co-Founder, DocsinBlocks and BitcuDo Crypto Exchange, VP, BuySellFast Inc.

Each of the 26 teams was give 5 minutes to present their pitch which was followed by rigorous Q&A session. This final round was held on December 6 and 7, 2021. Based on the recommendation of the jury, 10 teams have awarded prototyping funding from Chitkara University NewGen IEDC.



NewGen IEDC has been set-up at Chitkara University by National Science and Technology Entrepreneurship Development Board (NSTEDB), Department of Science & Technology (DST), New Delhi, Government of India and our university has received a funding of 2.87 Crore under this project to support student projects. We have already supported more than 80 projects under NewGen IEDC and more than 1.5 Crores have been spent on these projects.

Awareness Sessions Organized by NewGen IEDC

1. A hands-on session on Design Techniques and Laser Cutting Operations was organised by NewGen IEDC on October 12, 2021. The session was delivered by Mr. Charanpreet Singh (Project Manager, CURIN) and Mr. Gurpreet Singh (Assistant Professor of Mechatronics) for students of Chitkara Design School. Around 20 highly motivated students showcased their own designs on improvisation and customization before shaping them into tangible form using laser cutting machine.
2. A session on How to win Project Funding from NewGen IEDC was organized for the students of Mechanical Engineering Department on October 7, 2021 and the same session was organized for students of Computer Science and Engineering Department on October 21, 2021. The objective was to make students aware about the funding opportunity available at NewGen IEDC. More than 250 students and faculty members attended these sessions that were delivered by Mr. Sagar Juneja – Assistant Dean, CURIN and Coordinator, Chitkara University NewGen IEDC.
3. A session titled Insight into Funding Opportunities at Chitkara University for Innovative Students' Projects was organised on December 15, 2021 as part of the orientation of first year engineering students. The resource persons were Dr. Sachin Ahuja - Director Research, CURIN; Dr. Adarsh Aggarwal - Professor CEED, Dr. Gurjinder Singh - Assistant Professor, CURIN, and Mr. Sagar Juneja - Assistant Dean, CURIN. The event was attended by more than 500 students who were informed about the various grants available for them in the university including Newgen IEDC, MeitY TIDE 2.0, NIDHI PRAYAS etc.

Awards

CURIN faculty got recognition on national & international platforms

- Dr. Meenakshi Dhiman, Assistant Registrar, PHD Programs, CURIN received First Prize (Academic Category) at the eminent SDG (Sustainable Development Goals) Action Awards 2021 organized by United Nations Development Programme and Government of Punjab on October 28, 2021. She received this prize for her project titled Magnetically Separable Nano Materials and Rice Husk Based Water Purification Unit, which offers a potential solution for two major problems in Punjab namely disposal of rice husk and the increased levels of organic and inorganic contaminants in drinking water.



- International Institute of Organized Research (I2OR), India conferred prestigious International Researcher Award 2021 to Dr. S. N. Panda, Director, Research, CURIN for his relentless contribution in research. I2OR also gave him the title of Eminent Academician 2021 in their recently published book 100 Eminent Academicians of 2021, on December 25, 2021. I2OR is a registered MSME and is advocating United Nation's Sustainable Development Goals through Academic and Research Programs for API and Career Advancement Scheme.

Dr. S. N. Panda also received Certificate of Appreciation from Consul General of India, Vietnam for Coordinating the Lecture Series between Chitkara University, Punjab and Ho Chi Minh University, Vietnam 2021.

Fifteen New Industry Consultancy Projects Kick-started during October - December 2021

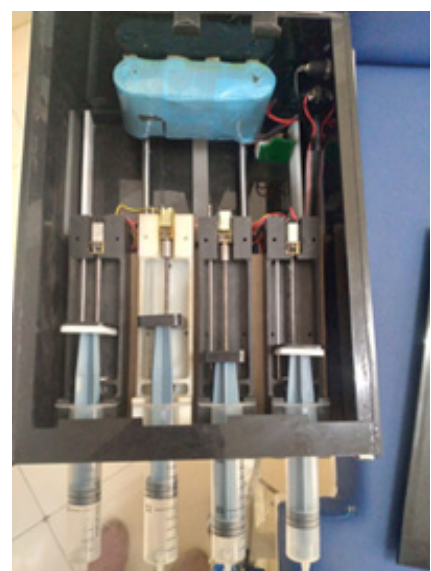
CURIN facilitated 15 consultancy projects that have been initiated by various faculty experts from different departments of the university during October – December 2021. As per the consultancy policy of Chitkara University, 90% of the consultancy fee is retained by the project heads (faculty experts).

Smart Drug Delivery System

Developed by a team of researchers in IoT and Cloud Computing Lab headed by Dr. S.N. Panda, Director, Research

To overcome the risks involved in the traditional drug delivery system, a computerized drug delivery system is required, which is without human intervention. As most of the medication errors are due to human intervention, a computer-controlled drug delivery system is a better approach to reduce medication errors. From the literature review, it has been found that in the traditional drug delivery methods errors occurred due to lack of mathematical skills. A study was conducted in the Felege Hiwot Referral Hospital (inpatient department), where 82 nurses were involved in the research for the study. Authors had analyzed the data using SPSS, and it was found that dose errors were 23.1%, due to wrong calculation of the drug (Feleke, Mulatu, & Yesmaw, 2015). Several technologies have been developed to reduce the human errors, however newly developed infusion pumps, specially smart infusion pumps have been designed to reduce medication errors (Pang, Kong, de Clifford, Lam, & Leung, 2011; Rothschild et al., 2005). The key benefit of an infusion pump is that a calculated amount of drug is delivered to the patient.

Therefore, adverse consequences can be avoided. Infusion pumps can improve medication safety. Therefore, computer controlled drug delivery systems can deliver/release an accurate amount of drug in the prescribed time. In this study we have developed an IoT based solution for the drug delivery and monitoring the patients. This system capable the doctors to view the patient data in real-time and deliver the drug to patients through the infusion pump. While delivering the drug through infusion pump hardware must be calculated carefully. We have used high precision stepper motors, actuators, lead screws and microcontroller to maintain the accuracy of the infusion. Triple distilled water is used to measure the accuracy of the infusion pump. Weighing machine is first tared to zero before taking the readings and all the readings are taken under temperature 22.5°C and humidity 52% RH. For measuring the weight digital weight machine (Mettler Toledo/ B123147691) having a range 0-210 gm with 0.01/0.1 mg least count is used.



Faculty Development Program on Entrepreneurship

Organised by CIIF | Attended by 30 faculty members

Chitkara Innovation Incubation Foundation (CIIF) organized a two week Faculty Development Program on Entrepreneurship during December 13-25, 2021. The program was conducted exclusively for faculty members with entrepreneurial bent of mind who were interested in converting their innovative project ideas into start-ups. The event was inaugurated by Dr. Archana Mantri, Vice-Chancellor, Chitkara University, Punjab and she emphasized on the fact that entrepreneurship has become one of the driving forces of economic growth and development & faculty members can play a pivotal role not only in the development of the entrepreneurship mind-set among the students but also can co-create, collaborate & co-operate start-ups along with students.



Dr. Adarsh Aggarwal - Head, CIIF and Dr. Neeraj Kumar – Incubation Manager, CIIF guided participants on start-up building and its successful execution. Dr. Aggarwal gave a demonstration on how ideas should be pitched for funding in an effective way. This was followed by project pitches by the participating teams.

The participants were given a lot of inputs by experts on how market analysis is done, how to access the strength and weaknesses of the competitors, how to build market strategies, revenue model etc. The program also involved a lot of team building activities and preparation of pitch decks.

Dr H.K.Mittal - Former Adviser, Ministry of Science & Technology, NSTEDB, DST, Govt. of India was invited to be deliver an expert talk during the FDP, wherein he discussed topics like cost evaluation of start-ups, value proposition, competitors in market, unfair advantages of the ideas etc. Mr. Chandan Tiwari - Founder & CEO of Entrepreneurial Development Council delivered a workshop on Design Thinking in the FDP. The program was attended by 30 faculty members of the university.

Other Activities of CIIF

- With the entrepreneurial landscape growing leaps and bounds, budding entrepreneurs are in need of initiatives that can support their growth and simplify the complex challenges of the ecosystem. Based on the need, CIIF organized a Three-day Entrepreneurship Awareness Camp (EAC) during October 8-30, 2021. CIIF invited participants to get engage, interact & attend the immersive sessions with entrepreneurs and industry experts along with hands-on knowledge & expertise.
- CIIF organized a Progress Review Meet for the start-ups incubated under MEITY TIDE 2.0 scheme on October 18, 2021. The participants presented the progress of their start-ups and received feedback from the review committee headed by Dr. H. K. Mittal.
- CIIF organised a pitching session titled FLASH PITCH on October, 19, 2021 wherein 13 student start-ups of CAP Cohort -III got an opportunity to pitch their ideas in front of jury members, after successful completion of 'Foundational Course on Entrepreneurship'.
- During Nov 29-30, an event titled The Winning Pitch#2 was organized by CIIF which comprised a boot camp on Day 1 for young entrepreneurs, where their ideas and pitch decks were reviewed and refined. On Day 2, participants presented their pitch decks to the mentors and 13 teams got selected for the finale.
- Chitkara Innovation Incubator Foundation (CIIF), Chitkara University signed a MoU with Easy to Pitch Networks Private Ltd on December 21, 2021. They are one-stop solution for all pitching and funding needs for the startups. Dr. Archana Mantri, CEO, CIIF exchanged the MOU with Priyanka Madnani, Founder & CEO, Easy to Pitch Networks Private Ltd. The MoU was signed to explore areas of mutual collaboration and cooperation between CIIF, Chitkara University and Easy to Pitch. It will offer collaborations opportunities and programs exclusively for the pitches of CIIF and budding entrepreneurs. The MoU will create synergy between CIIF and Easy to Pitch in innovation and entrepreneurship related programs.



Participation in External FDP by CURIN Faculty Member(s)

Dr Meenakshi Dhiman attended a FDP under the DBT-PSCST Skill Vigyan Program held at the Institute of Nano Science and Technology (INST), Mohali during December 6-26, 2021. The program was focused on advanced researches in nano sciences. It was a platform to discuss the cutting edge research trends in interdisciplinary research, collaborative projects and facilities available for researchers. This FDP was an initiative of the Punjab State Council for Science and Technology to promote research culture in the state.



CURIN Faculty Members Invited as Resource Persons in Multiple Events

Delivered Keynote Talks, Invited Talks and Chaired Sessions in Conferences

- Dr. Prateek Srivastava - Associate Professor, CURIN delivered an invited talk on Radiant Cooling System organized by ASHRAE student chapter on October 2, 2021. It was focused on providing insights about the said technology and discussed how to design the cooling system for Indian climate conditions.

Energy Conservation Club, CURIN in association with ASHRAE Student Chapter, Chitkara University conducted a webinar titled Role of VFD in Building Efficiency Enhancement on October 30, 2021. The talk was focused on various energy efficiency opportunities in buildings using variable frequency drives.

More than 70 students and faculty members from different organizations attended the webinar which was conducted by Dr. Prateek and Dr. Jasminder Kaur Sandhu – Assistant Professor, CURIN.

Dr. Prateek published an article titled 'Radiant Heating & Cooling System for Residential Building' in Indian Green Building Council (IGBC) magazine entitled ENVIRONORTH. It discusses issues of high energy consumption in urban areas in day to day life, and methods to increase efficiency of radiant cooling system that could save energy compared to conventional air based systems.

- Dr. Amit Mittal - Professor and Dean, DRC, CBS participated as expert committee member in the Institute Research Committee (IRC) meeting of Symbiosis Institute of Management Studies (SIMS), Pune, India held on October 8, 2021. He also chaired a session in the 12th Annual International Research Conference organized by SIMS during December 20-22, 2021. He served as reviewer in the same conference.

Dr. Mittal was one of the resource persons in the one-week workshop on 'Research Methodology' organized by Ch. Bansi Lal University, Bhiwani, India in November 2021.

- Dr. S. N. Panda – Director, Research, CURIN chaired a paper presentations session on the topic Signal Processing in the IEEE sponsored conference titled 6th International Conference on Signal Processing, Computing and Control (ISPCC 2k21) organized by JUIT, H.P. during October 7 - 9, 2021. In the same conference, Dr. Deepali Gupta – Professor, CURIN chaired a session on Emerging Areas of Soft Computing, Internet of Things and Artificial Intelligence. In addition, one of the PhD scholars of Dr. Panda, Ishita Seth presented her research paper titled IoT based Smart Application and Recent Research Trends in this conference. Additionally, research scholars of Dr. Kalpna Guleria - Associate Professor, CURIN also presented five papers this conference.

Dr. Panda chaired paper presentations sessions in two more conferences - 2nd International Symposium on Computer Vision and Machine Intelligence in Medical Image Analysis 2021 by Sikkim Manipal Institute of Technology held during November 11-12, 2021 and Conference on Innovative Technologies in Intelligence System and Industrial Applications



(CITISIA 2021) by IEEE CSU NSW during November 24-26, 2021.

- Dr. Jyotsna Kaushal - Professor, Center for Water Sciences, CURIN delivered an invited talk at the international workshop on the theme Competency Advancement in Water Resource Technology on October 28, 2021. The Office of International Affairs, Chitkara University in collaboration with Tarlac Agricultural University, Philippines organized this workshop. Dr. Kaushal discussed various green pathways such as phytoremediation, bio-char, and their mechanisms for treatment of wastewater.
- Dr. Meenakshi Dhiman - Assistant Registrar, PHD Programs, CURIN delivered an invited talk on 'Trends in Chemical Technology: Applications of Nanotechnology in Medicine and Pharmaceuticals' to the faculty members of Ho Chi Minh University of Technology and Education, Vietnam on November 5, 2021.
- An invited lecture by Dr. K. R. Ramkumar – Associate Professor, CURIN on the topic 'Big Data & its Analytic Framework' was delivered at the national program for training of scientists & technologists working in government sector under the DST Schemes. It was conducted as part of the course titled Big Data Management & Comprehensive Analysis organized by C-DAC, Mohali during November 29 – Dec 3, 2021.

Dr. Ramkumar and Dr. Amanpreet Kaur – Assistant Professor, CURIN chaired a paper presentations session on Post Quantum Cryptography and Hardware Security in the 6th IEEE International Conference on Signal Processing, Computing and Control.



Dr. Amanpreet also presented her research work on the topic of Conducting FPGA experiments using Augmented Reality and Virtual Reality: A Review in the same conference.

Dr. Amanpreet Kaur also chaired a session in a conference titled Modern Electronic Devices and Communication Systems (MEDCOM 2021) organized by G. L. Bajaj Institute of Technology and Management, Greater Noida during October 29-31, 2021. In the same conference, Dr. Amanpreet and Dr. Ramkumar and their research scholars presented two papers.

- On December 3, 2021 Dr. Shalli Rani – Associate Professor, CURIN delivered a keynote address at the International Conference on Network Communication and Information Security (ICNCIS2021) organized by Sanya, China. The topic of her talk was 'Emerging Trends and Technologies in Internet of Things (IoT)'. She discussed about 5G, 6G, Blockchain, SDN, and NDN in IoT applications.

On November 19, 2021 Dr. Shalli Rani and her research scholar Ankita presented a paper on Analysis of Machine Learning and Deep Learning in Cyber Physical System Security at the International Conference on Computing and Communication Networks 2021 that was organized by Manchester Metropolitan University, UK.

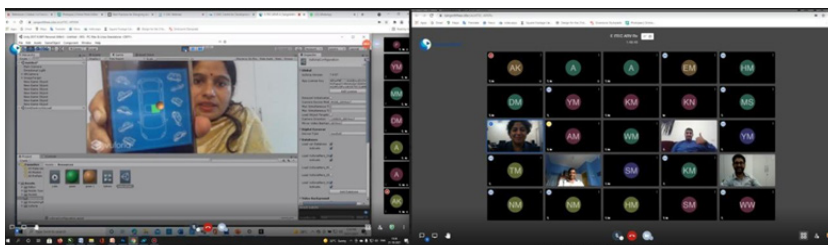
- Dr. Pankaj Kumar - Professor and Dean, PhD Programs, CURIN was invited to deliver an expert talk in the 28th National Conference on Liquid Crystals (NCLC 2021) organized by Assam University, Silchar, Assam during December 21-23, 2021. The title of his talk was 'Preparation and Characterization of Reverse Mode Polymer Dispersed Liquid Crystal for Performance Advancement in Display Applications'. The conference was organized in association with the Indian Liquid Crystal Society.

Dr. Vandna Sharma, Dr. Pankaj Kumar and Kuldeep Kumar Raina presented a paper on Study of Electro-optical Characteristics and Textural Behaviour Using Image Processing of Normally Transparent Polymer Dispersed Liquid Crystals in this conference. Two more papers titled In Situ Self-Assembled SNPs Induced Vertically Aligned Dye Doped Nematic Liquid Crystal by Dr. Vandna and Ridhima Gahrotra, and Experimental Investigations of Cholesteric Liquid Crystals - Influence of Dichroic Dye and Applied Voltage by Ankit Rai Dogra and Dr. Pankaj Kumar were presented in the same conference.

Hands-on Workshops Conducted

Specialized Training Program in Augmented and Virtual Reality by IITL
Science Kunj Skilling Program for Young Professionals (SciSKY) by CUCIF

Immersive and Interactive Technology Lab (IITL), CURIN, conducted more than 50 training programs in 2021. One such program was the Specialized Training Program in Augmented and Virtual Reality in collaboration with CDAC, Mohali, and Indian Technical and Economic Corporation (ITEC), Goa. The program was conducted during October 18-22, 2021.



Experts from both the organization jointly facilitated and mentored the researchers, innovators, academicians and industry stakeholders. More than 60 participants from different countries including India, Myanmar, Thailand, Palestine, Sri Lanka, Peru, Kenya, and Maldives availed the opportunity to enhance their skills in A-VR technology.

The participants were imparted hands-on experience on game engine Unity 3D & Vuforia SDK. In addition, the faculty members and scholars also explored 2D/3D graphics, designing and modelling software like Adobe Photoshop/Blender/Photopia. Towards the end of the training program, participants made an AR based app "CAR CONFIG AR".

Dr. Bhanu Sharma, Assistant Professor (Research) and Mr. Narinder Pal Singh, Lead Developer from IITL, CURIN, Chitkara University organized this training program. The program established strong ground for future international collaborations and partnerships in this area.

Skilled development programs, when blended with research knowledge, provide enormous opportunities to youngsters. Chitkara University Central Instrumentation Facility (CUCIF) organized Science Kunj Skilling Program for Young Professionals (SciSKY) during November 10-12, 2021. SciSKY is a skill development program focused on developing the capabilities of students to use research-based knowledge and research methods, including design of experiments, analysis, and its interpretation to provide valid conclusions. The program was conducted by Dr. Gurjinder Singh, Assistant Professor as a facilitator and, Mr. Nikhil Dhull, as resource person, both from CURIN. The program was intended to generate research acumen and skills for employment amongst young professionals. Around 35 students from the Chitkara College of Pharmacy participated in the program and were given hands-on experience in bacteria sample preparation and its testing. Students were also given exposure to the basic testing facilities available at CUCIF.



Savita Kashyap - Research Scholar, VLSI COE, CURIN attended a workshop titled 'Hands-on Training on Installations of Solar Panels' organized by Electronics Sector Skills Council of India (ESSCI) at the Manav Rachna International University, Faridabad during November 8-14, 2021. The program focused on testing of PV modules and components, earthing, connection setup and installation of solar panels on the rooftop. Research scholars and faculty members from different universities participated in this workshop.



List of Publications

CURIN faculty members and scholars have published research papers/book chapters in SCI and Scopus indexed journals, conferences, and books. This alphabetically sorted list contains those publications that have been indexed in Scopus during October-December 2021.

- A. Khanna, R. Pandey, J. Madan, and A. Dhingra, "Comprehensive Device Simulation of 16.9% Efficient Two-Terminal Pbs-Pbs CQD Tandem Solar Cell," *Optical Materials*, vol. 122, p. 111677, 2021.
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