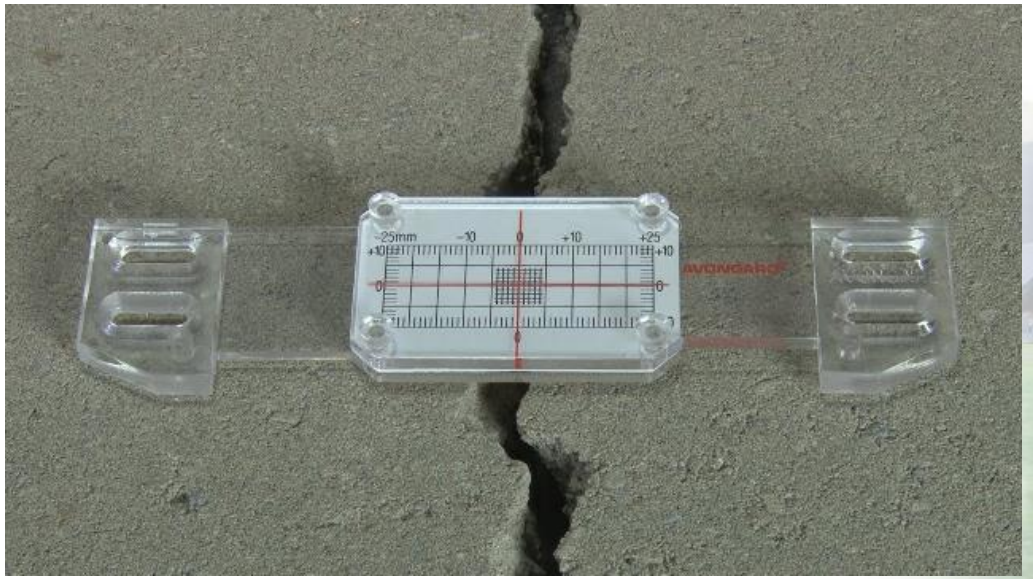
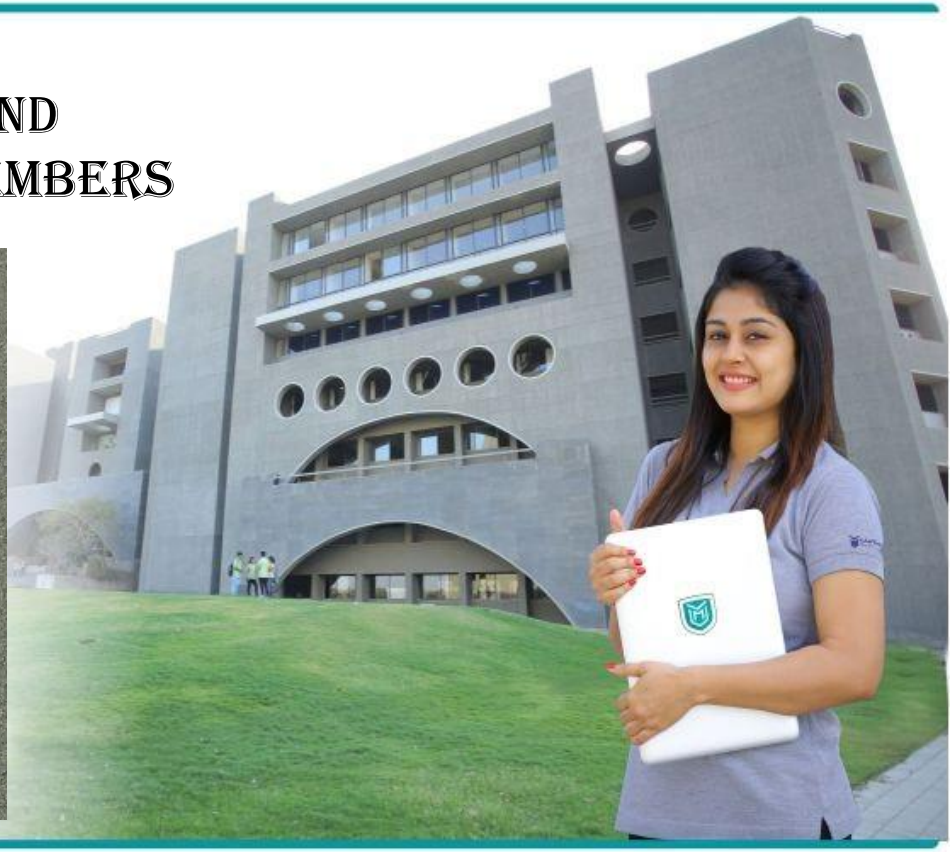
Project Proposal for SSIP/NEwGen IEDC support and funding

Marwadi University

Title of innovation

IOT ENABLED CRACK MONITORING AND MEASUREMENT DEVICE FOR CONCRETE MEMBERS





Contents

The Team

Sr. no.	Name	designation	Enrollment no.	Role in the team	Contact
1	Tapan Khokhariya	Team Leader	92000133006	Coordination, overall work execution and implementation	9925447430
2	Dr. Ankur Bhogayata	Lead Mentor	NA	Conceptualization, mentoring and guidance	9727724676

The Problem

The problem

- The experimental investigations on the flexure members namely Beams requires detailed assessment of all the parameters.
- The beams can be evaluated for their response in flexure in terms of load and deflection primarily.
- During the test, the cracks on the beam surface takes place and those are the symbols of deformations.
- The cracks also indicate the strain occurring in the member at a given load and can be measured with LVDT or strain gauges.
- However, the deflection and strain in form of time vs velocity can be obtained, but the cracks can not be directly measured with conventional instruments like vernier or rulers. Moreover, the real time crack monitoring and their data collection and storage is not possible.
- If the cracks developing during the measurement or on-going experiments, can be measured and analysed, the study of beam can be further improved and valuable information on the material behavior can be understood.
- This challenge inspired the team to work on this project.

Flexural Test of beam: Sample

The innovation / solution

The work consist of making a device which will be portable and able to collect live images of ongoing experiment, capture the images of cracks using sensors and camera, store the data and analyze the same for crack dimensions, positions and locations from the saved data.
Moreover, the data may be collected remotely also by using the gadgets connected online to transfer the details via internet also.
The innovation will consist three stages for the proposed apparatus

1. **Automation:**
   Automated crack identification during the flexural test of concrete beams, stored in a database, and shown on a graph.

2. **Digitalization:**
   The suggested equipment would make use of strength measurement, still and motion capture of crack advancement, and common code specifications.

3. **Internet of Things:**
   Information from sensors, graphs, and fractures may be saved in the cloud and accessed from any device.

The product

“IoT Enabled Crack monitoring and measurement device for concrete members”

- This gadget seeks to close this gap by offering a thorough and in-depth study of the cracks that developed in concrete members subjected to loading under test circumstances. Our device can gather, transfer, and save data on cloud platforms by applying image processing concepts, giving researchers and experts access to vital data regarding the size, location, and pattern of the fractures.

- With our equipment, you may quickly get runtime data from a distant device using a website that is accessible from any device with an internet connection. This function provides a practical and effective approach to keep an eye on the health and safety of concrete structures even from a distance.

- In conclusion, our technique offers a novel approach to a persistent issue in the engineering discipline and has the potential to completely alter how we investigate and track cracks in concrete buildings. We appreciate your time.

The market opportunities

•It is crucial to monitor the civil structure's performance and safety in order to enhance maintenance procedures, lower repair costs, and eventually raise public safety.

•This device can be used in damage detection algorithms to assess the post-event condition of a structure.

•Continuous crack detection was employed to distinguish deviations from design performance.

•Continuous crack detection was used to identify deviations from the performance of the design.

•Python, image processing, sensor data, and web technology are all used in the strain graph plotting and display on the website, as well as the live feed or video of the test.

Customers

There are ample opportunities in form of the customers for the product/ proposed apparatus as shown below

1. Professional material testing laboratories.
2. Material testing laboratories at the academic and research institutes.
3. Companies / agencies from the civil engineering contracting profession.
4. Industries or manufacturing units making the lab instruments for civil engineering branch.

The technology

The development of the proposed apparatus is inspired from the IoT platform. Hence the technology will be

1. Automation of the manual operations
2. Raspberry Pi: Serve as a central processing unit, handling all processing.
3. Pi Cam is an image sensor that records images, videos, and live feeds; NodeMCU/Arduino transmits data from sensors that measure temperature, gas, and humidity to the Pi.

The development of the apparatus will involve scientific bases or technologies pertaining to the

1. Civil engineering
2. Mechanical engineering
3. Computer engineering
4. Electronics and communication
5. Information technology

The Support and Funding requirements

SR.NO.	ITEM	QUANTITY	Approximate expenditure amount in INR
1	Sony image sensor set and wires, and miscellaneous electronic items related	As per design requirements	15,000
2	Digital display with HDMI input (Medium size)	As per design requirements	25,000
3	Metal casing (Fabricated and ready made)	As per design requirements	15,000
4	Sensors for temperature, humidity, and data collection	As per design requirements	5,000
5	Jetson nano developer kit and relevant accessories	As per design requirements	40,000
6	App development, domain, programming, documentation and IPR support.	NA	30,000
		Grand total in INR	1,30,000/-

Thank you ….

Question?