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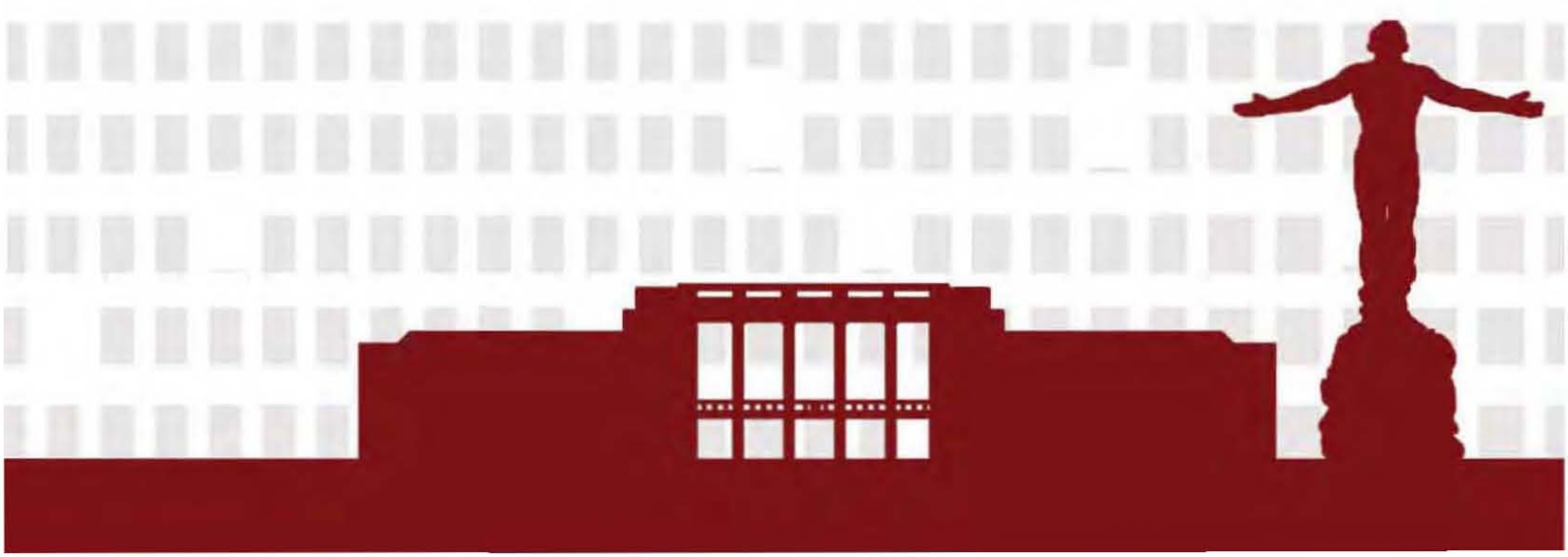

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COST-EFFECTIVE MICROCONTROLLER MATERIAL STRENGTH IMPACT TESTER USING PLX-DAQ FOR DATA ACQUISITION

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ABSTRACT

Material testing centers in the province of Camarines Sur is a rarity and a luxury to acquire. There is one material testing center which is privately owned and the DPWH Regional Testing facility in Albay is located several kilometers away from the province of Camarines Sur. Majority of the Universities and Colleges in the province offering Civil Engineering and their allied professions, do not have a Material Testing Machine which is operational and duly certified by DPWH.

The material strength impact tester is used for measuring impact strength of selected engineering composite materials and products. The study was developed to provide numerical and graphical data to determine the impact force applied on concretes of predetermined dimensions. The prototype was designed to induce impact load to a specimen and from the derived data make comparative conclusions as to the strength of the tested material. An impactor was responsible for delivering the impact into the test specimen. A free-fall mechanism of the device comprises of springs and hand lever and a tri-pulley system to lessen the load of the impactor.

The device is equipped with sensor systems to measure the vibration using an accelerometer and an ultrasonic transducer for identifying the rebound height after the impactor strikes the test sample, and with a data acquisition system to record and monitor the read-out vibration, distance, and the time.

A microcontroller served as the controller for the device, sensors such as accelerometer and ultrasonic t ransducer were the inputs. Driver circuit was used for the switching of the DC motor for lifting and dropping the impactor. For the data display acquisition of the device a Parallax Data Acquisition (PLX-DAQ) served as the software for the acquisit ion of the measured variables.

Results of testing were conclusive and showed that the device can detect variations between the test samples in terms of vibration and rebound height reading. Further study on the post-processing of the data reading could be performed and accurate numerical data could be retrieved. Cost-effectiveness is also an advantage of the device but still requires further validation upon redesign of the prototype. Other mechanisms for free fall could be considered like magnetic strips, pneumatics, and hydraulic system for better operation. The study was limited on testing the impact strength of concrete, but it can be designed to test other composite materials like structural steel, and other materials where impact strength is considered of great importance.

Keywords: Material Strength Impact, Microcontroller, Impactor, PLX-DAQ

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