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SENSOR BASED BAT EDGE DETECTION SYSTEM

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ABSTRACT

This paper describes the significant design to build a sensor based edge detection system for cricket. The game of Cricket, and the use of technology in the sport, have grown rapidly over the past decades. However, technology-based systems introduced to adjudicate decisions in run outs, stumpings, boundary infringements and close catches are still prone to human error, and thus their acceptance has not been fully embraced by cricketing administrators. In particular, technology currently employed for bat edge decisions is not fault proof or time efficient. Although the Snickometer may assist in adjudicating such decisions, it depends heavily on human interpretation. The aim of this study is to investigate the use of sensors in developing crickets edge-detection adjudication system. Live data samples using sensors for ball-on-bat events from a cricket match, will be recorded. Data analysis will then be employed on these samples. Results will show the ability to differentiate between these different sensor events. This is crucial in developing a fully automated system.

INTRODUCTION

Main aim of this concept is the use of sensor setup in bat, this sensor is nothing but a vibration/force sensor. By using these sensors, we continuously monitor our bat and pad. If the any kind of interruption comes to any sensor, depending upon the priority we get the result of the event as the player is out or not. In this system we mainly focus on OUT detection of the cricket players, and handle tricky situations such as the ball hitting the bat first or pad first or if the ball has contact with the striker more than once in a very short time interval and the decisions are made from the priority of the sensor detection. This sensor data is monitored through IOT.

METHODLOGY

Technology today is used for detection of minute changes in impact of ball on the bat. However it comes with disadvantages and eliminates human factor. The setup consists of piezoelectric sensor and wifi module overcomes the disadvantage and delivers accurate result in far less time than the existing system. Upon impact the vibration sensor can sense vibration above the tuned threshold value and the input processed through the main controller.

The output is displayed through LCD Display/Wifi module is used to transmit the data to live screen in the stadium and can be viewed and controlled from anywhere in the world.The input impact is processed with the main controller used in the paper is Atmel's ATmega328. The micro controller controls and co-ordinates all the system activities with the smart program burned in to the chip.

SYSTEM DESIGN

The main design is to program the Arduino microcontroller board to collect signals from the piezoelectric sensor check the availability of network and record data or transmit to webserver. C++ programming language is used to build this program.

First stage of program is to check connectivity or availability of all sensors and modules once powered ON. It checks connectivity or availability of piezoelectric sensor, LCD display and later checks for the availability of the ESP 8266 Wi-Fi module.

The next stage is to read the data from the sensors and transmit the data with the use of Wi-Fi module. The data is shown in graph format and values can be exported in CSV format to excel sheet.

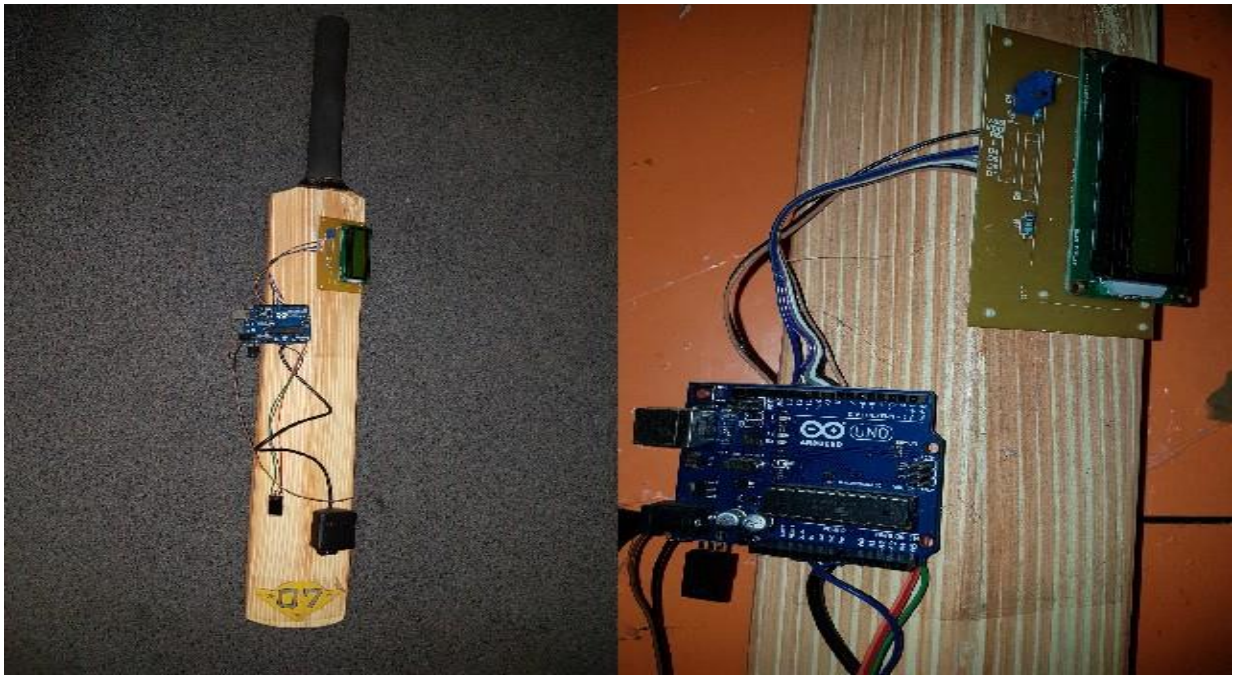


Figure 1: Sensor based bat edge detection system

When the microcontroller board is powered ON, it loads the program and initializes all sensors and modules connected to the microcontroller board. When impact happens on bat, sensor sends signal. This analog signal is converted into digital values and transmitted through the ESP 8266 wifi module using SPI protocol (Serial Pheripheral Interface Protocol) to web server. If thr wifi module is not connected or network is not available then CSV mdule of the program is invoked and data from the sensor is stored.

RESULT

The experiment to detect the bat edge in a match was conducted and proper results were obtained. The output graph shows the vibration in the system upon impact.

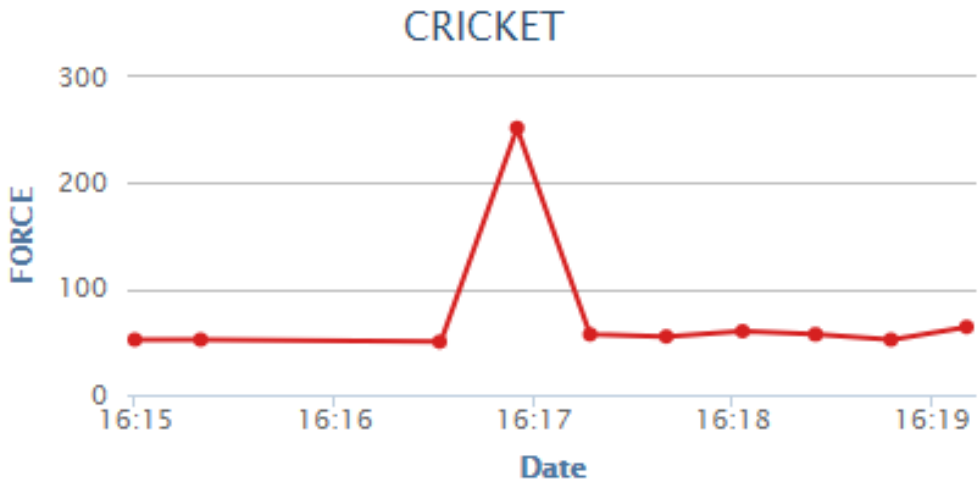


Figure 2: Output graph 1

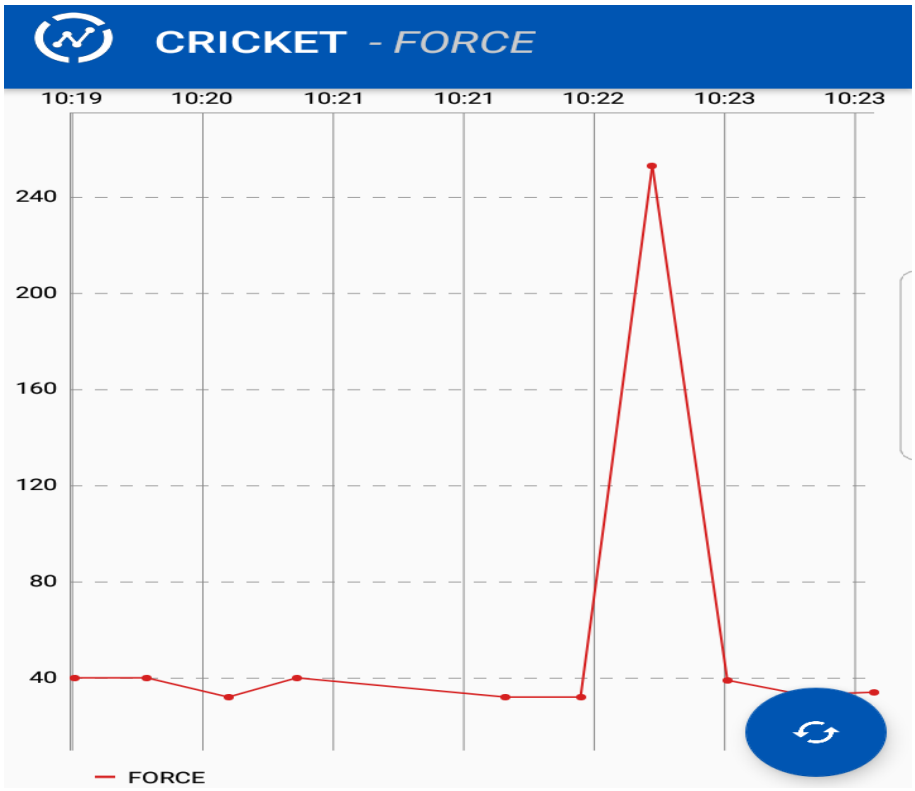
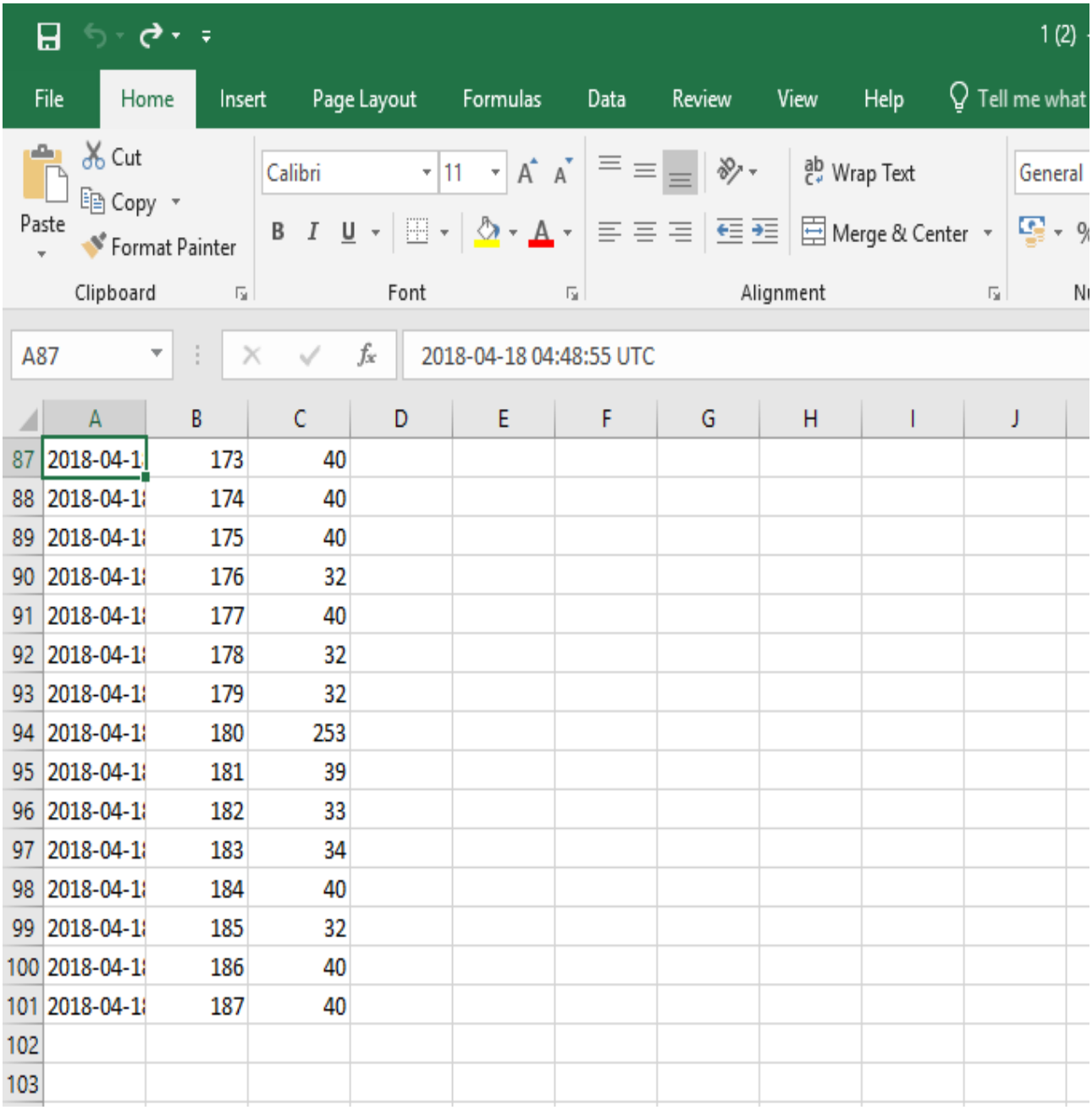


Figure 3: Output Graph 2

The above graph, graph 2 shows vibrations at values at each input with the peak value above 240 when the input impact was higher.The piezoelectric sensor could sense accurately vibrations above the fixed threshold value and the input was processed efficiently through the controller. The output is displayed in wave format in the monitor which is then used to deliver accurate decision. Values are also displayed on the LCD display mounted on the bat.

The system delivered results faster than the existing system the main aim of the paper, to reduce time consumption in delivering results. Use of Wi-Fi module has made the time reduction possible and efficient.



	A	B	C	D	E	F	G	H	I	J
87	2018-04-1	173	40							
88	2018-04-1	174	40							
89	2018-04-1	175	40							
90	2018-04-1	176	32							
91	2018-04-1	177	40							
92	2018-04-1	178	32							
93	2018-04-1	179	32							
94	2018-04-1	180	253							
95	2018-04-1	181	39							
96	2018-04-1	182	33							
97	2018-04-1	183	34							
98	2018-04-1	184	40							
99	2018-04-1	185	32							
100	2018-04-1	186	40							
101	2018-04-1	187	40							
102										
103										

FIGURE 4: Output values in CSV format

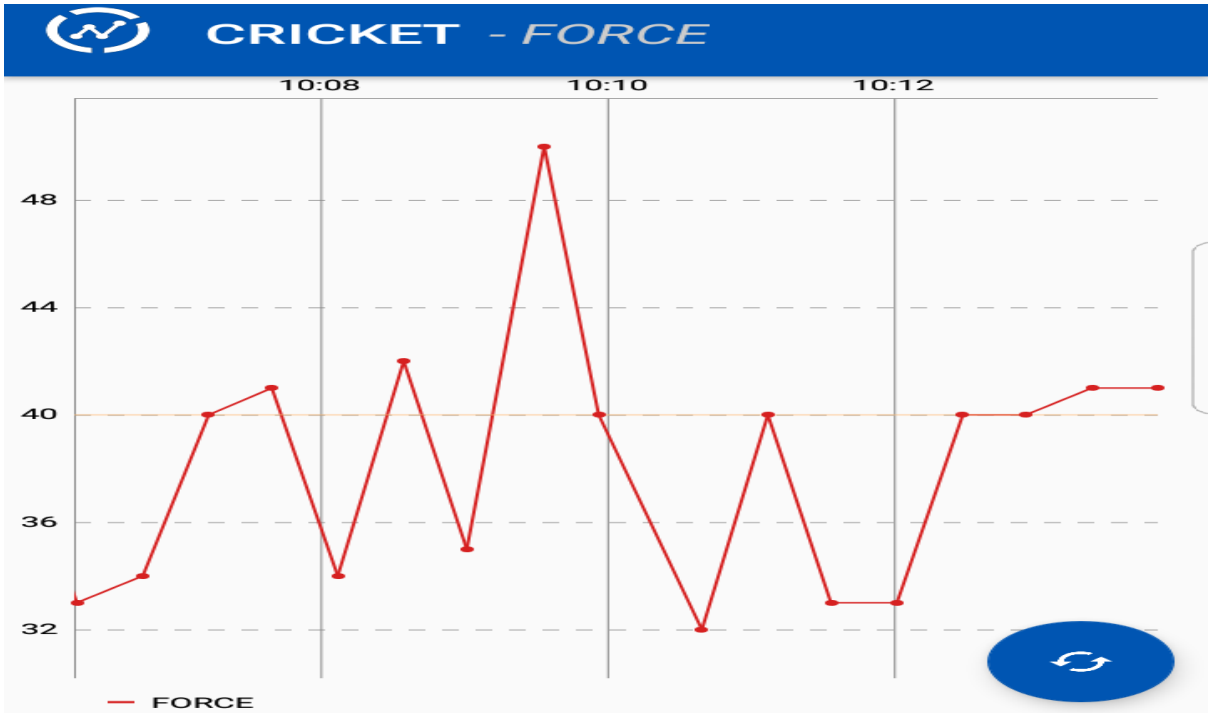


Figure 5: Output graph for varying input

CONCLUSION

The system comprising of piezoelectric sensor, controller and wifi module delivered fast and accurate results of bat edge detection. This is done by implementing piezoelectric sensor and processor chip which upon acquiring input processes it and forwards output to display and decision is made. The work was developed at low cost, however we are making only a prototype, some improvements should be done to make it more compact and reliable. I hope this system will play a supportive role for the umpires in decision making.

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