BULLET SPOT DIMENSION ANALYZER USING IMAGE PROCESSING

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ABSTRACT

In this paper, we proposed the product that finds the solution using camera to capture the target to identify the middle of black aiming mark and center of shots. The system determines the value of shots and then display on LED. Bullet Shots are detected using image processing at the shooting board. The location and dimension value computed available for display on the shooter end. At same time this calculated values can be shown into real time displays for the spectators. The improvement of this system is that it does not require trained person to accurately find location and distance of targets. The product on which work is carried out is to detect bullet spot using web camera. Development of the proposed system carried out research in shooting games and to point out automatic methods to declare the winner. This requires study of c language programming, serial communication technique, hardware/software interfaces and most significantly work in MATLAB. Thus, the contribution of this system is to provide a location, dimension of bullet spot accurately and quickly using image processing.

Keywords:

Data acquisition , Image processing , MATLAB, PIC, RF communication, Serial communication

I. INTRODUCTION

In this paper, the bullet spot is detected using Image acquisition toolbox with the help of digital camera and then the distance between centre of shooting board and bullet spot is calculated with the help of image processing in MATLAB. The calculated distance is expressed in millimeter (mm) which gives a accuracy to the results. The calculated distance in computer transmitted to hardware unit with data acquisition toolbox through parallel port communication and received data feed to display controller to display the data on LCD at spectators side and then using RF communication dimensions displayed on shooter side on computer using serial port communication up to 100mt distance. Image processing is a physical process used to convert an image signal into a physical image. The image signal can be either digital or analog. The actual output itself can be an actual physical image or the characteristics of an image. The most common type of image processing is photography. In this process, an image is captured using a camera to create a digital or analog image. In order to produce a physical picture, the image is processed using the appropriate technology based on the input source type. Three Principal Uses of Image Processing are Improvement of pictorial information for human interpretation, Compression of image data for storage and

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transmission, processing of image data for autonomous machine perception to enable object representation, detection, classification and tracking. MATLAB provides extensive library support for various domains of scientific and engineering computations and simulations. The Image Processing Toolbox software is a collection of functions that extend the capability of the MATLAB numeric computing environment. The toolbox supports a wide range of image processing operations. MATLAB provides a very easy platform for image acquisition and processing. Even serial and parallel ports can be directly accessed using MATLAB. It provides a powerful built-in library of many useful functions for image processing. The basic data structure in MATLAB is the *array*, an ordered set of real or complex elements. This object is naturally suited to the representation of images, real-valued, ordered sets of color or intensity data. MATLAB stores most images as two-dimensional arrays (i.e.matrices), in which each element of the matrix corresponds to a single *pixel* in the displayed image. (Pixel is derived from *picture element* and usually denotes a single dot on a computer display.) For example, an image composed of 200 rows and 300 columns of different colored dots would be stored in MATLAB as a 200-by-300 matrix.[1,2]

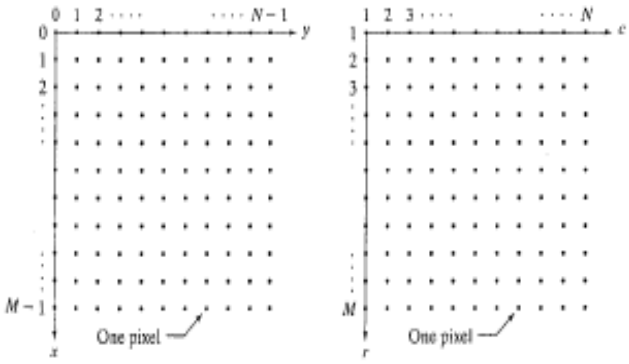

Fig 1: Matrix

II . EMULATION OF STANDARD DEVICE

Paper targets are very commonly used in target shooting competition at National level, and may be used for the qualification rounds of ISSF events at World Cups. A target consists of a black aiming mark and scoring rings as shown in figure 2.

Fig. 2: Shooting Board

The score is evaluated after shots have been fired. The introduction of shooting dimension system will make an enormous difference to the presentation of these events because no longer the shooters and spectators have to wait for targets to be scored and results posted. The machine scans the target to locate the centre of the black aiming mark and the centre of the

shot and the internal computer calculates the value of the shots. The big advantage of this product is that it does not require trained and experienced personnel to accurately and rapidly score targets. The objective of this research is to design and develop a shooting dimension system comprising of a) hardware systems and b) software systems to support these tasks.

The product comprises of microcontroller 89C52. RF communication is used in transmission of data from transmitter to receiver. The image processing toolboxes, image acquisition toolbox and data acquisition toolbox are used in developing a complete product.[5,7]

III. SYSTEM ARCHITECTURE

3.1 Transmitter Unit

Camera is connected to PC via USB port. It is used to scan the target to locate the centre of black aiming mark and then capture the images in real time. The distance between the centre of shooting board and bullet spot has been calculated using image processing in matlab. Then, calculated binary distance in matlab software sends through parallel port communication from pc to microcontroller unit for processing of data as microcontroller convert the binary data to decimal format to display on LCD. Microcontroller AT89C52 is the heart of the system. It is used for processing of data. AT89C52 is used as high insystem programmable flash memory. Microcontroller is further connected to encoder HT12E which converts parallel data into serial data. The 315 MHz ASK module is used to transmit signals. This module is widely and cheaply available. Whip antenna is used for transmitting signal.[3,4]

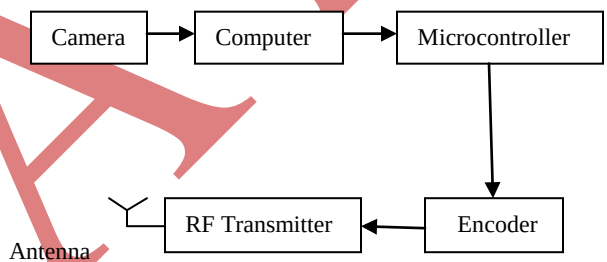

Fig 3: Transmitter Unit

3.2 Receiver Unit

The receiver unit takes its input from antenna connected to 315 MHz ASK module. It receives data and passes it to HT12D decoder. The decoder converts serial data into parallel data. These data are further sent to microcontroller for their processing. The processed data will be displayed on shooters monitor with the help of MAX 232 IC.

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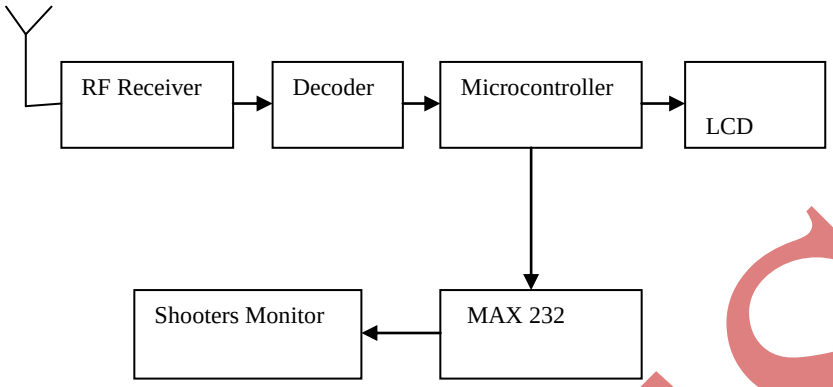
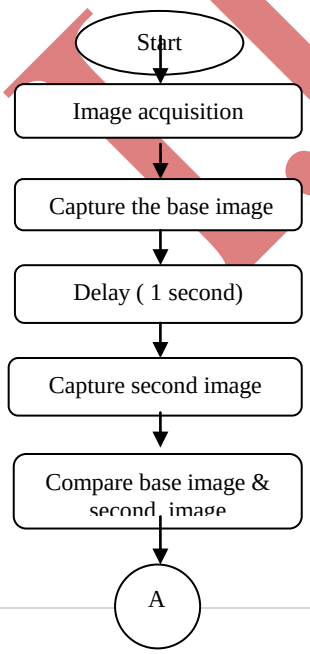


Fig. 4: Receiver Unit

IV. SYSTEM DESCRIPTION

The designed system make shooting game an accurate game. Our designed system calculate the exact distance of bullet spot on shooting board from center point. That distance calculated is X which is displayed on PC and LCD on receiver side. The system we developed has shown a targets of each shooters that displayed on PC. Suppose ten shooters take participates and all of them shoots on board and our system shows distance X of ten players on computer accordingly.

4.1 System algorithm



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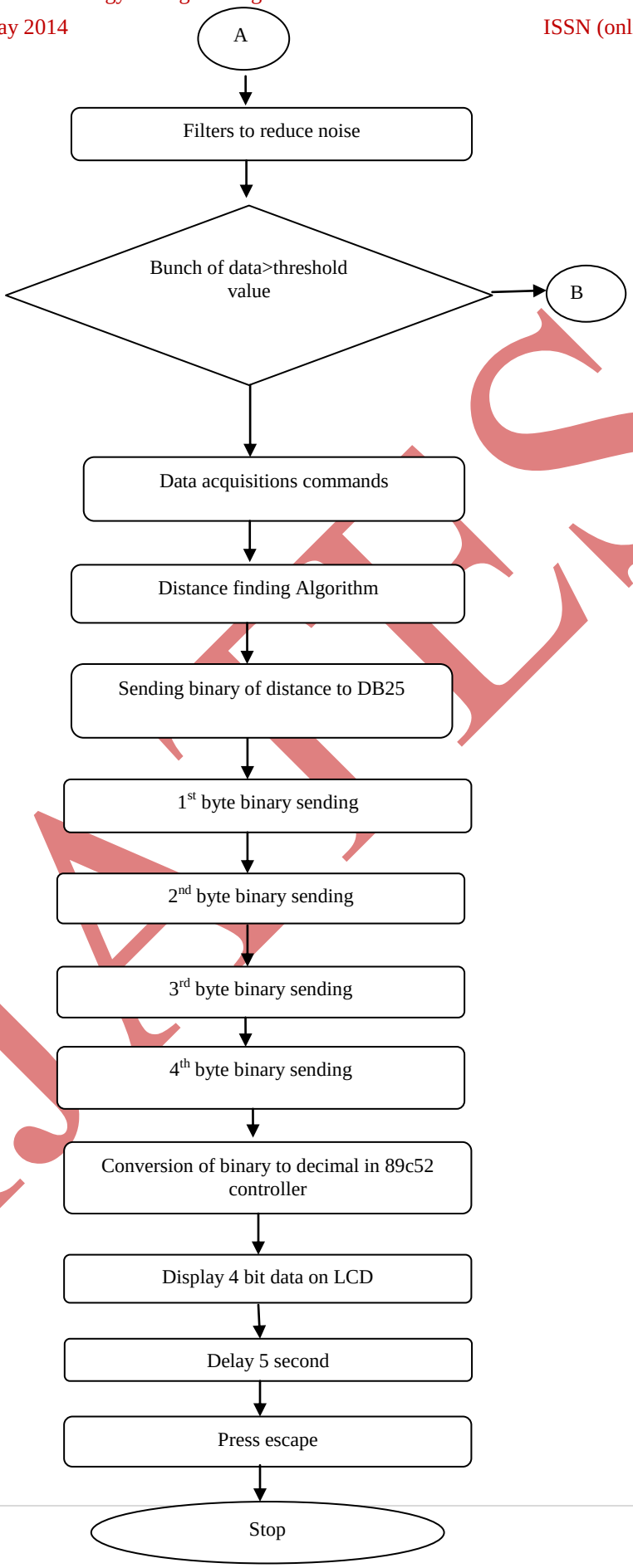

V. RESULT

Above results shows the significance of the shooting dimension system by image processing. Dimension or Value of shot is define as distance between centre point of shooting board and centre point of bullet spot.

% Error = [Actual – Experimental / Actual] × 100

Table 1 : Results

Sno.	Theoretical Value	Practical Value	% Error
1	15 cm	15.2 cm	1.33
2	12.4 cm	12.6 cm	1.61
3	4.3 cm	4.4 cm	2.32
4	2.3 cm	2.5 cm	8.69
5	0.2 cm	0.1cm	50
6	0.8 cm	0.9 cm	12.5
7	8.2 cm	8.4 cm	2.43

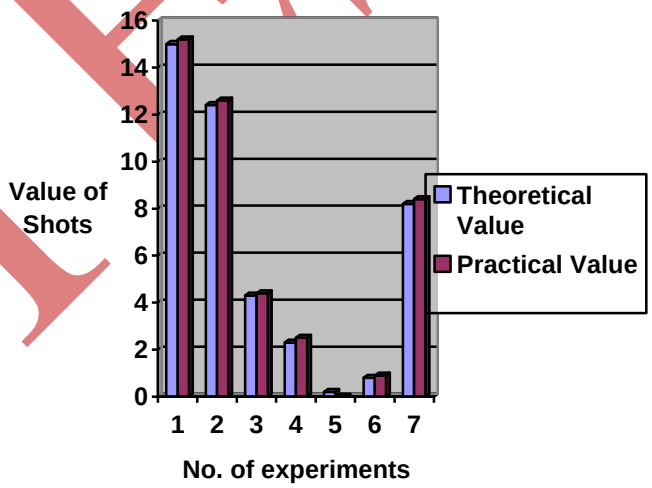

Fig 5: Graph b/w no. of experiments and value of shots

VI. CONCLUSION

In this paper we discussed on how the shooting dimension system developed and became a powerful tool to assist the million of sports people with their development. What are the technical and other issues which will make this device became more popular in current century. The proposed microcontroller based shooting dimension system would bring more convenience for the sports people because this will be the best system in shooting games to get the distance of spot of bullet from center of shooting board and further modifications like develop software and database which gives the ranking of players according to their target hits on the board. This make this system economical as well as reliable for international shooting games.

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