Weapon and Metal detection

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Abstract— Metal detection is a physical system that can be used in a military and security to detect metals spatially concealed weapons and un authorized devices. An ultrasonic sensor is used for the detection. The speed of reflected ultrasonic waves from different types of objects is measured. The materials that been used are paper, plastic and metal key as an experimental objects. The distance between the sensor and the object 10 cm we conduct the experiment. The proposed system is an automatic system that works all together when a person comes near to the ultrasonic waves detects the person along 3 meter away and then the IP camera is turned on automatically to capture a video to the suspect. Once the person walk; through the gate that contains the electromagnetic coil and that person holds a metal object a LED is turned on in the main monitoring room and the video that been captured by the camera is sent to the main monitoring room computer and the suspect will be known to the security policemen, in case the person who walk through the gate dosen't hold a metal object the video that been captured by the camera is automatically deleted and the LED in the main monitoring room stays off. In the additional experimental work we tested the speed of reflected waves off of different types of objects including paper, plastic and metal key to see the difference in speed

Index Terms— Minimum 7 keywords are mandatory, Keywords should closely reflect the topic and should optimally characterize the paper. Use about four key words or phrases in alphabetical order, separated by commas.

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1 INTRODUCTION

THIS A physical protection system (PPS) integrates people, procedures, and equipment for the protection of assets or facilities against theft, sabotage, or other malevolent human attacks. The design of an effective PPS requires a methodical approach in which the designer weighs the objectives of the PPS against available resources, and then evaluates the proposed design to determine how well it meets the objectives [1].

Metal detection is a physical system, the need of such a system appears for high security, since the evolution of technology and so many methods appears to detect metals spatially concealed weapons and un authorized devices. Current technology in that field includes x-rays, metal detectors using ultrasound, metal detectors using millimeter wave and metal detectors using magnetic fields. Despite the success of portal type metal detectors based on magnetic fields, commonly found in airports, there remains concern that many weapons still cannot be detected by this means. Examples are ceramic guns and knives, explosives, and inflammables that might be used by terrorist groups to destroy public facilities or to seize and hold hostages. Also, it is not always convenient to quire people to pass through a portal for screening, and it is necessary in many instances to look for concealed weapons in crowded situations such as at gatherings where public officials might make appearances. These extra requirements on detestability lead naturally to the necessity for imaging the person or scene of interest so that a trained human observer might judge whether or not a weapon is present. As automatic target nxognition techniques improve, this technology will be used to replace the human obsemer except in cases where verification is needed [2].

In our research we'll focus on ultrasound. The advantage of ultrasound over magnetic metal detection is that ultrasound does not need the object being examined to be ferromagnetic; it can detect materials regardless of their magnetic properties. It also offers a cost- competitive alternative to x-rays and does not involve ionizing radiation [3-4].

2 Methodology

2.1 flowchart of project

This flow chart summarizes our project's steps of work. And tells brief idea about the whole work we've done during this (Fig.1)

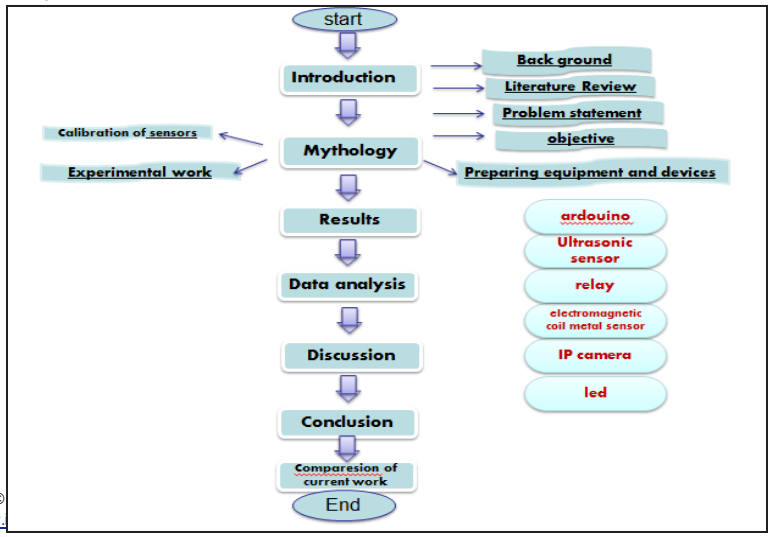

Figure 1-flowchart of project.

2.2 Experimental work

For When the ultrasonic waves interrupted by an object (target) the waves reflect off of the object back to the source of the ultrasonic wave generator which is the HC-SR04 sensor, when the waves reaches the source the relay will be turned on due to an arduino code that controls the relay to make it works only if there is a target 3 meters away from the gate and the distance help to provide enough time for the IP camera to turn on and capture a video to the suspect. When the suspect walks through the gate the electromagnetic coil will detect if the suspect holds any type of metal objects and if so the camera will save the video and send it to the main monitoring room computer else, the video will be deleted..see fig 2. The software development with cod which has been use to programming the system as showing in appendix A.

Figure 2-experimental work hardware.

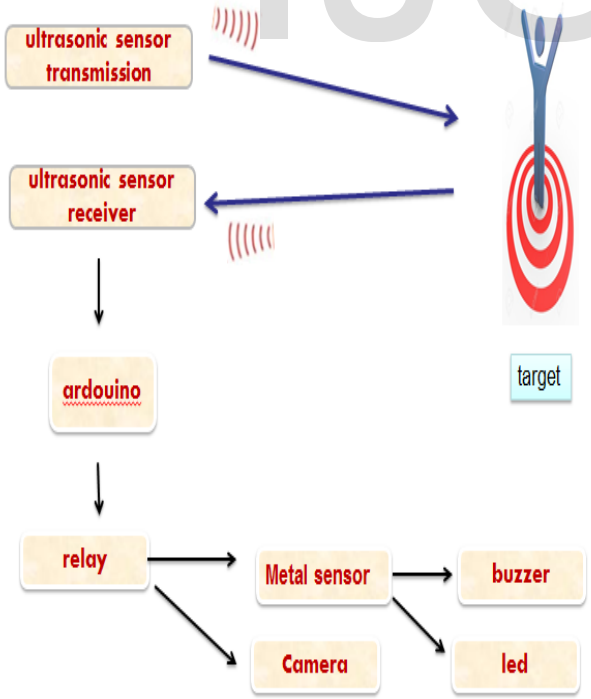

Figure 3-experimental work flowchart.

3 ULTRASONIC WAVE RESULTS

As The additional work we trying to add to our experiment is some calculation to show the difference in the speed of ultrasonic waves when it reflects off of an different types of objects. We choose paper, plastic and metal key as experimental objects. The results show with distance 10 cm with paper object have time to response 593 second , metal 584 second and plastic 628 second.(see table 1).

Object type	Distance in centimeters	Time in seconds	Speed cm/sec
1	paper	10	593	0.01686345
2	metal	10	584	0.01712328
3	plastic	10	628	0.01523455

Table 1-addional test.

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4 Conclusion

The metal detection can be used to detect weapon. Our system is an automatic system that works all together to prevent un-authorized person from accessing the building we trying to secure by using IP camera and electromagnetic coil gate to detect different types of metals including weapons. Finally its can conclude from analyzed results the speed wave of metal faster than paper and plastic, so it can detect the metal object based on speed of wave response.

Acknowledgment

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Appendix A

```
#define TRIGGER_PIN  12  // Arduino pin tied to trigger pin on the ultrasonic sensor.
#define ECHO_PIN     11  // Arduino pin tied to echo pin on the ultrasonic sensor.
#define MAX_DISTANCE 200 // Maximum distance we want to ping for (in centimeters). Maximum sensor distance is rated at 400-500cm.

#define RELAY_LINE1_PIN 8

#include "NewPing.h"
NewPing sonar(TRIGGER_PIN, ECHO_PIN, MAX_DISTANCE); // NewPing setup of pins and maximum distance.

unsigned int distance = 0;        // Current distance of any object facing the ultrasonic sensor
int critical_distance_cms = 50; // Cutoff distance at which the light will switch
bool state = 0;

void setup() {
 pinMode(0, OUTPUT);
        Serial.begin(9600); // Open serial monitor at 115200 baud to see ping results.
        pinMode(RELAY_LINE1_PIN, OUTPUT);
        digitalWrite(RELAY_LINE1_PIN, HIGH);          // Turn the light off
}

void loop() {
        delay(50);                    // Wait 50ms between pings (about 20 pings/sec). 29ms should be the shortest delay between pings.
        ReadDistance();
        Serial.print("Ultrasonic: ");
        Serial.print(distance); // Send ping, get distance in cm and print result (0 = outside set distance range)
        Serial.println("cm");

        // Someone is near the door
        if (distance < critical_distance_cms)
        {
                while (distance < critical_distance_cms)
                {
                        // Check if they moved away
                        ReadDistance();

                        delay(5); // Do nothing until the person moves away from the door
                }

                state = !state; // Change the state of the relay

                if (state)
                {
                        Serial.println("cammera Open!");
                        digitalWrite(RELAY_LINE1_PIN,    LOW);
        // Turn the light on
                }
                else
                {
                        Serial.println("cammera Closed!");
                        digitalWrite(RELAY_LINE1_PIN,    HIGH);
        // Turn the light off
                }
        }
}

// Updates the value of the Ultrasonic reading
void ReadDistance()
{
        // Read 7 values from the ultrasonic and get the median value ( median filter )
        // Gets rid of noisy reading
        distance = sonar.convert_cm(sonar.ping_median(7));

        // The value 0 indicates that the ultrasonic sensor is reading nothing in front of it
        // Set this distance to max distance so the light doesn't switch unnecessarily
        if (distance == 0)
        {
                distance = MAX_DISTANCE;
        }
}//led pin tall connect with + and the short wire connect with no1 and the com connect with ardoino
```