Micro-Controlled Automated Smart Tag-based Attendance Register (M. A. S. T. A. R)

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ABSTRACT
In this paper of ours we have tried to put up hardware design, as to how it might be possible to implement an idea which is efficient, accurate and, it goes without mentioning, automated. We are trying to devise a monitoring system that tracks the entry and presence records of individuals inside a confined space. *The Micro-controlled Automated Smart Tag-based Attendance Register* (*M.A.S.T.A.R)* uses microcontrollers and laser sensors to detect the presence or entry of a person and in a triggered event stores the details of the person in form of a image or video. Every image or video segment has its own tag that uniquely identifies the new entrant and updates the pre-existing entrant records.

***Index Terms / Keywords*:**
head-counter, microcontroller, attendance-checker, automated-monitoring, Atmega8

1. INTRODUCTION
Dealing with a significantly large count of people in any sort of confined gathering , be it an office organisation, a symposium meet or a mere academic class room, becomes much more efficient and controllable within range if a count of people is provided and more so, if the count is followed by an attendance specification of the individual.

In this proposed approach, we have tried to present our design and implementation of the microcontroller based system. The entire system has mainly three modules of which we are going to discuss one over here. The modules are (1) The Microcontroller Module, (2) The Capturing Module and lastly (3) The Database Module. Our chief focus in this paper would be to implement the Microcontroller Module that detects the entry or exit of an individual. In the Microcontroller module we use an AVRboard with on board programming configuration.

We would first go through some related works in the field of Microcontrollers. Then moving on to the project at hand, we will see the devices used in the hardware module, the basic algorithm that it would follow and the pseudo codes that are to be implemented to detect the entry and exit using the ATMEGA8 component. In the rest of the paper we would have an idea of the penultimate and the final step of the project and its future scopes.

2. RELATED WORKS
The project described here is a culmination of many streams of electronics and computer science. We will see applications along fields of microcontrollers, circuit designing, image/video processing, and database management throughout the three modules that we will be working on. So, based on all the topics covered here, not much work has been done. But still the motivation and the idea came from somedistantly related projects, as below.

Theophilus Wellem and Bhudi Setiawan ofSatya Wacana Christian University, Salatiga, Indonesiaworked on a project "A Microcontroller- based Room Temperature Monitoring System" where they used Atmega 8535 and LM35 Temperature sensor to provide an automated solution.[4]

2012 showed the advent of another duo from MIT, Manipal , Nikhil Agarwal and G.Subramanya Nayak who came up with "Microcontroller based Home Security System with Remote Monitoring" where they devised home security system using IR sensors, temperature sensors and ATmega16.[5]

Mohammad Syuhaimi, et.al. proposed GSM applications for home surveillance systems in their work “Developmentof camera and GSM interfacing system for home security surveillance" using camera and motion sensors to track down individual's positions modules.[1]

AVR microcontrollers can be interfaced to mobile devices to automate the electrical system for a household including its security and surveillance. Christin John Thomas proposed such a work in his paper,"Intelligent Sensor Based Building Automation and Energy Management."ISSN: 2277 128X, August, 2013.[2]

G. Song, Z. Wei, W. Zhang and A. Song deployed sensor nodes thus creating a mesh network which was accessible via Bluetooth and internet to create a complete home monitoring and control system as is described in their work “Design of a networked monitoring system for home automation”.[3]

Prof. Inderpreet Kaur worked with simple LDRs, LEDs, ADC, Relays and Microcontroller 8051 to design an automated home security system. His work in "Microcontroller Based Home Automation System With Security” provided a simple yet effective approach to surveillance area.[6].

An approach was made by V. Sathya Narayanan et.al. in their paper "Design of Wireless Home automation and security system using PIC Microcontroller" [7] using PIC microcontrollers and ZigBee wireless communication module to control the entire domotics along with speech recognition and GSM technology.

N. Sriskanthan, F. Tan, A. Karande.[8]in their work "Bluetooth based home automation system"applied Bluetooth technology and wireless communication to provide security surveillance from remote devices interfaced through microcontrollers.

Jer-Vui Lee, Yea-Dat Chuah and Chin-Tin Chai proposed an idea of UART based home security systems in their paper “A Multilevel Home Security System (MHSS)”. [9]

3. PROBLEM DESCRIPTION
The need for a monitoring system is never questionable. Individual records kept and managed manually, are not only tedious but also prone to errors and create loop holes which are detrimental in case of a good monitoring system.

A monitoring system usually involves cameras or video recording setups that are constantly monitored by individuals from a control room. But missing out on something important during a video feed, a small lapse may prove costly. So we planned to make the system automated by itself so that we no longer need to rely upon human efficiency or labour.

The project determines the entrant, tracks it down in the database and updates all the logs related to the individual all by itself. We not only get a module that supports as a monitoring unit but also provides a count of total entries to keep a better track of proceedings.

4. SYSTEM DESIGN

The basic principle by which the counting procedure is done is depicted in Fig. 1: (a) provided below. Considering that the same gate will be used both for the entrance and exit two sensors will be installed on the same horizontal plane along the entrance and exit routes.

Sensor1 and 2 are basically two optical transmitters (lasers) and the other end receives the signal using LDRs. As an individual passes by the signal is interrupted and according to the order in which the signal is interrupted we can decide whether the person is entering or exiting.

So, if it is taken that first Sensor 1 is disrupted and then sensor 2 it would mean that the person is entering and this would trigger the microcontroller which does the job henceforth. The microcontroller checks on the attendance count and play a role in the automation of the room's electrical amenities and synchronize the camera snap shot to be taken.

There will be two lenses to take snaps at either end of the gate/doorway so that they are also activated as and accordingly by the microcontroller which in extension relies upon the optical sensors.

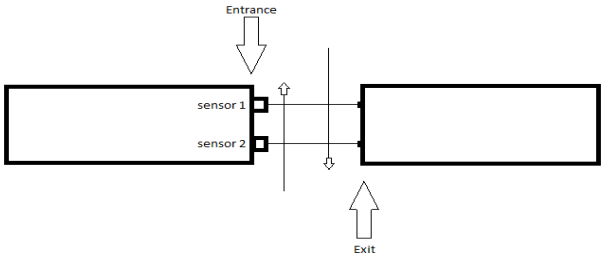

Fig. 1: (a) (Top View)

So for example Fig. 1: (b), if Sensor1 provides hint of entry the microcontroller immediately sets up the entry camera (cam 1) and the individual entering has a snap taken within seconds. The time of snap shot and the image provides information of the person and time of entry.

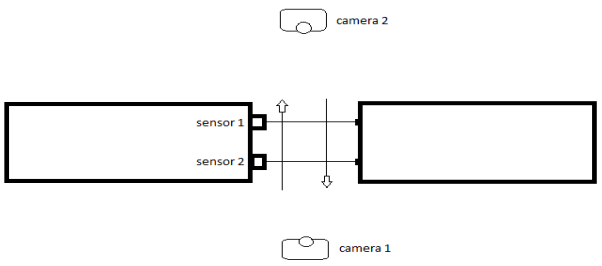

Fig 1: (b)

5. ALGORITHMS

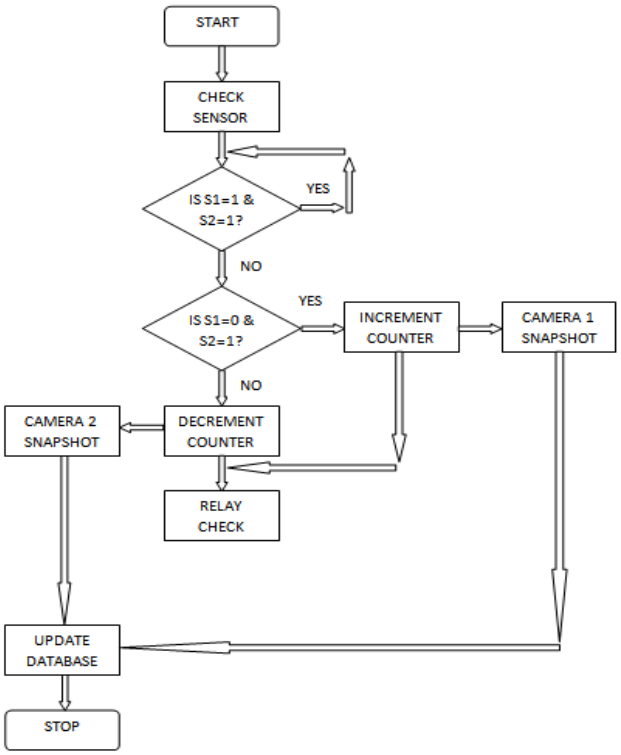

Fig. 2: flowchart for the working of the module

A brief algorithm for the working of the module is provided above in Fig. 2. The Flowchart describes the step by step function of the hardware module:

1. The checking procedure goes on in a loop until it senses any of the discrete conditions.
2. If S1, S2 combination stays (1, 1) [1 being the uninterrupted state] go to Step 1 else go to Step 3.
3. If S1, S2 combination is (1,0) go to Step 5 else go to Step 4.
4. If S1, S2 combination is (0, 1) go to Step 6.
5. Increment counter through microcontroller module. Checks relay system. Trigger the entry camera module for respective recording.
6. Decrement counter through microcontroller module. Checks relay system. Trigger the exit camera module for respective recording.
7. End of checking phase. Return to Step 1.

I. 6. HARDWARE DESCRIPTION

Starting from the entry or exit of an individual till the moment before the trigger for camera module is provided falls under the hardware module. The main components of the hardware setup are as follows.

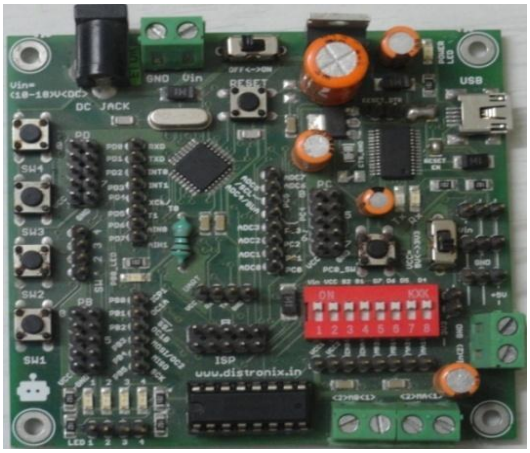

Fig. 3: AVR Board

Shown above is the AVR development board. It has an on-board programming module.

It has ATMEL ATmega8 embedded on it. AVR chip has a small amount of flash memory in it. That memory is where the program is stored. When the chip starts up it starts running whatever program are in the flash. So all we have to do is to write to that flash memory.

The Atmega 8 is a low power CMOS 8-bit microcontroller based on AVR RISC architecture. The ATmega8 achieves throughputs approaching 1MIPS per MHz, allowing the system designer to optimize power consumption versus processing speed.

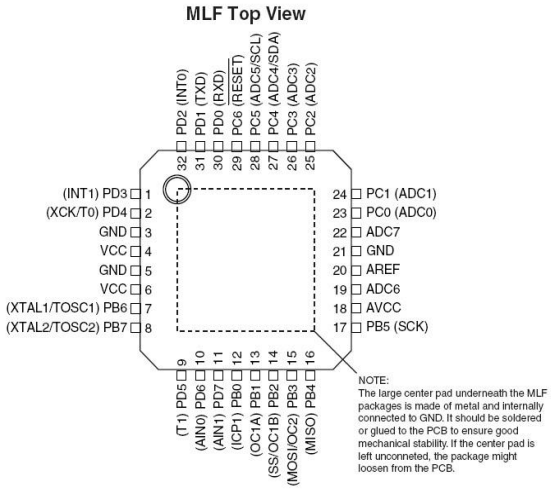

Fig.4: Atmega 8

Atmega 8 has the following features:
8 Kbytes of In-system Programmable Flash with Read-While-Write capability

- 512 bytes of EEPROM.
- 1 Kbyte of SRAM.
- 23 General purpose I/O Lines.
- 32 general purpose working registers.
- 3 flexible timer/counters.
- Internal and external interrupts.
- A serial programmable USART.
- A byte-oriented Two-wire Serial Interface.
- 6 channel ADC with 10 bit accuracy.
- Programmable Watchdog Timer with internal Oscillator.
- SPI serial port. and
- % software selectable power saving modes.

- **Display Board**
  The display unit provides the net head count at any time .For this unit we use a 16X2 HD44780 LCD display module. Fig.5 shows the 16X2 LCD display module used.

- **Optical Sensor unit**
  As transmitters we use optical lasers model no: RYS1230 of 5mW, 6V specification and as receiver units we use 10mm LDRs.

Fig. 5: 16X2 LCD display module

7. FUTURE SCOPE

Looking forward, the plan is to implement the three circuits that are needed.

- The camera module for each end.
- The module to analyze the image/video inputs.
- The database module for creating the log.

The camera module will be managed by the microcontroller hardware.

In case of any offices or institutes where there is a fixed count of individuals to be monitored, we will create a database with individuals and a photo tag of each of them.

Every time an authorized individual passes through the snap shots taken would compare the image with the pre existing image tag in the database, confirm the individual and update the attendance count and the time of entry of that person. When the same person exits the place the exiting cam shoots a second snap which again after confirmation with the database will update the exit time and the attendance count. These temporary 'entry', **'exit**' snaps and the permanent image in the database helps us confirm an individual. Thus for a place like an office or an institute, for every person we have a detailed, timed data

regarding a person's presence and absence. Based on this data the attendance count can be generated.

In case we have a situation where the attendance is not fixed and registered, i.e. there is no database of individuals pre-existing we will dynamically create a database and every new individual image will be tagged according an entrant number. Next onwards every time the same person passes through the temporary image will be processed based on the existing image in the database.

8. CONCLUSION

In the end it is thus concluded that the entire setup not only automates the entire monitoring system but in the process of keeping track through database management helps in reducing all kinds of human error that may creep up. Not only monitoring system, this device can be used as a state of the art security system in specific cases like banks where the device permits entry to only some authorized personnel whose image has previously been registered into the system.

9. ACKNOWLEDGEMENT

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