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Smart Automated Video Conference Room System

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Abstract— *The aim is to design the automated video conference room system, placed at the center of conference table and use the two voice sensor to locate the speaker in order to capture the face of speaker or person currently speaking in conference room. To make video conference room fully automated, we also make a system which controls the light and AC of conference room. In this paper, Embedded Real time video monitoring system based on ARM is designed, in which the embedded chip and the programming techniques are used. The central monitor which adopts Raspberry pi is the core of the whole system.*

Keywords— *Raspberry pi, AVR Microcontroller, Conference Room, USB Webcam, Voice sensor, LDR sensor.*

I. INTRODUCTION

In video conference system variations of technologies are use in order to track the location of the current speaker. Currently, in video conferencing system uses the camera is located at corner of conference room in such way that camera captures the entire member's and their conversions available in conference room. This camera is limited in one direction. Video conferencing differs from videophone calls as it is designed to serve a conference or multiple locations rather than individuals. In recent years, there has been an increase in video surveillance systems in public and private environments due to a heightened sense of security. The next generation of surveillance systems will be able to annotate video and locally coordinate the tracking of objects while multiplexing hundreds of video streams in real-time. Video surveillance has been evolving significantly over the years and is becoming a vital tool for many organizations for safety and security applications. The Video surveillance systems play an increasingly important role to maintain social security. It has been widely used in many fields, such as finance, public security, banking, and home. Traditional video surveillance can generally achieve close distance monitoring, by using the PC as a monitor host, monitor host connected monitor camera with coaxial cable. Initially, it was dominated by analog cameras connected using coax cables. For cost and Performance reasons, there was a switch to digital switching systems and now IP-based delivery of data.

II. LITERATURE SURVEY

Recent development in field of fully automated video conferenceing start from evolution of voice location in conference. Use of Microphone array which detects location of speaker and then control is given to automatic camera controller which turns camera in direction of arrival speaker [1]. Later a close form method for localization of source position given only the sensor array time delay estimate information, it is real time microphone array application base on linear intersection [2]. System use earlier were complex and low use of technology. Use of microphone array, with proposed algorithm for detection, shown to be easily applied to cases of near field, short observation, multiple users microphone array [3]. Before used technology was low advance and multiple use of cameras were required, hence placing camera at centre of table and use microphone array to locate speaker [4]. IP address based video transmission in created network with minimum cost and multiple users can be done using raspberry pi module [6].

III. BLOCK DIAGRAM AND DISCRIPTION

Block diagram contains following elements given below:

AVR Microcontroller
Raspberry pi
Temperature sensor
LDR sensor
Voice sensor
USB Webcam
DC Motor

A. AVR Microcontroller

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The AVR was one of the first microcontroller families to use on-chip flash memory for program storage, as opposed to One-Time Programmable ROM, EPROM, or EEPROM used by other microcontrollers at the time. AVR stands for Alf (Egil Bogen) and Vegard (Wollan)'s RISC processor. The AVR is a Modified Harvard architecture 8-bit RISC single chip microcontroller (μC) which was developed by Atmel in 1996. The AVR was one of the first microcontroller families to use on-chip flash memory for Program storage, as opposed to One-Time Programmable ROM, EPROM, or EEPROM used by other microcontrollers at the time.

Technical Details of AVR Microcontroller:-

- High-performance, Low-power 8-bit Microcontroller
- Advance RISC Architecture
- 32 x 8 General Purpose Working Registers
- 32K Bytes of In-System Self-Programmable Flash
- 1024 Bytes of EEPROM
- Non Volatile Program and Data Memory
- Boundary-scan Capabilities According to the JTAG Standard
- Extensive On-chip Debug Support

B. Raspberry Pi

Raspberry Pi 2 Model B is the second generation Raspberry Pi. It replaced the original Raspberry Pi 1 Model B+ in February 2015.

Compared to the Raspberry Pi 1 it has: A 900MHz quad-core ARM Cortex-A7 CPU, 1GB RAM.

Like the (Pi 1) Model B+, it also has:

- 4 USB ports
- 40 GPIO pins
- Full HDMI port
- Ethernet port
- Combined 3.5mm audio jack and composite video
- Camera interface (CSI)
- Display interface (DSI)
- Micro SD card slot
- VideoCore IV 3D graphics core

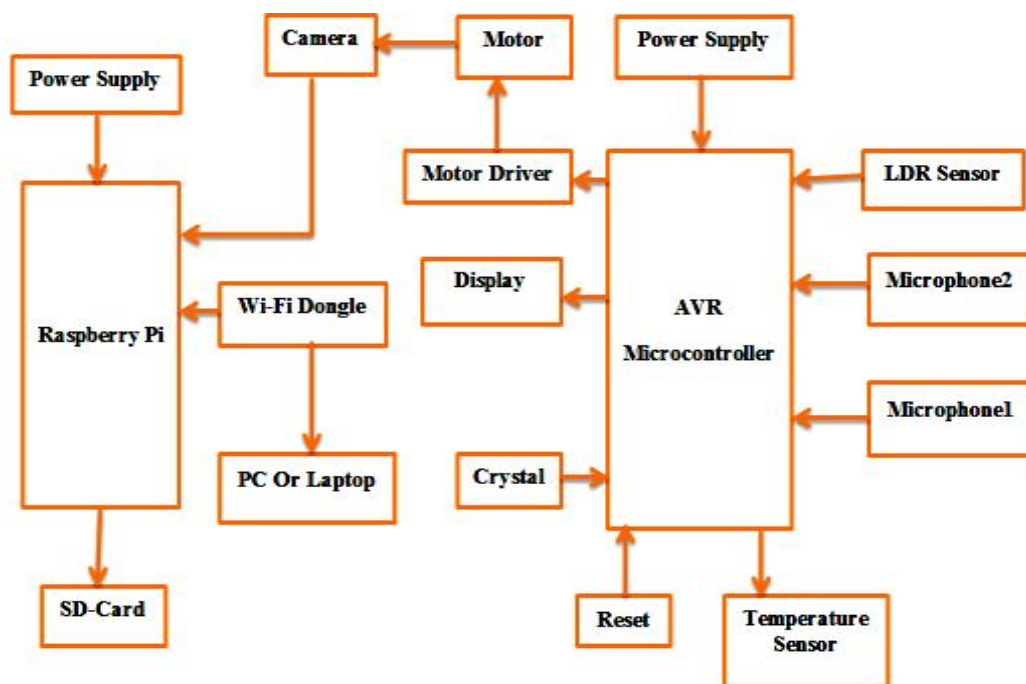


Fig. 1 Block Diagram

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C. Temperature Sensor

The LM35 - An Integrated Circuit Temperature Sensor:

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in °C) It has an output voltage that is proportional to the Celsius temperature. The scale factor is 0.01V/°C. The LM35 does not require any external calibration or trimming and maintains an accuracy of +/-0.4 °C at room temperature and +/- 0.8 °C over a range of 0 °C to +100 °C. Another important characteristic of the LM35DZ is that it draws only 60 micro amps from its supply and possesses a low self-heating capability. The sensor self-heating causes less than 0.1 °C temperature rise in still air.

D. LDR Sensor

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. A photoresistor or light dependent resistor (LDR) is a resistor whose resistance decreases with increasing incident light intensity. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

E. Voice Sensor

This is used to track the voice of speaker taking in conference hall. Voice sensor gives voice output to AVR, depends on Voice sensor output AVR rotates the motor to rotate the camera towards the current speaker.

1) Features of Voice Sensor:

Sensitivity: -44dB (0dB=1V/pa, 1KHz)

Impedance: 2.2K

Directivity: omnidirectional

Frequency: 20-16,000Hz

Voltage range: 1.5V-10V

Standard operation voltage: 4.5V

Current consumption: max. 0.5mA

Sensitivity reduction: within -3dB at 3V

S/N ratio: more than 60dB

F. USB Webcam

A webcam is a video camera that feeds or streams its image in real time to or through a computer to computer network. 14 Megapixels(interpolated), Maximum resolution is 640x480. Specification of WebCamera may differ company to company.

G. DC Motor

A DC motor is an electric motor that runs on direct current (DC) electricity. DC motors can operate directly from rechargeable batteries. 12 V dc motor, 300 mA, 12 rpm, +5 V power supply. But to drive motor there is requirement of motor driver, which has capability to rotate motor.

1) L293D Motor Driver

Thermal Shutdown

High Noise Immunity Inputs

Output Current 1 A Per Channel

600 mA for L293D

Peak Output Current 2 A Per Channel

Output Clamp Diodes for Inductive

Transient Suppression

IV. WORKING

As Shown in Block Diagram when voice sensor senses voice AVR Microcontroller is programmed to give command to motor driver and then to motor, to turn towards sensed voice sensor position. On top of motor video camera is mounted, which is then connected with Raspberry pi module which processes incoming video and streams it on wifi network through wifi dongle connected to

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module, thus the video can be seen in WiFi network on application of IP address generated by Raspberry pi module when Operating System is installed in it. In addition interfacing of temperature sensor and light sensor to AVR micro controller is done. Programming is done in AVR, and a minimum threshold value of temperature is set, if temperature sensed by temperature sensor is more than threshold value then fan should ON else OFF if temperature is below threshold value. Similarly if light intensity is below set intensity value bulb should glow else should remain OFF.

V. SOFTWARE USED

AVR Studio is used for Coding
 DIPTRACE for PCB Layout and Simulation.
 IPScan24- TO scan IP of Raspberry pi module
 Raspberry pi installation process software are Putty, Xming, Windows 32 Diskimager, Raspbian.

VI. RESULT

Tracking of voice location of current speaker can be obtained automatically using voice sensors, in turn motor rotates in the direction of speaker. As the camera is mounted on motor it simultaneously moves towards speaker and send this conversion on server via Wi-Fi dongle using raspberry pi platform. By tracking the IP address of device we can see the conversion between the employees seat in the conference room. Simulated circuit diagram is given below.

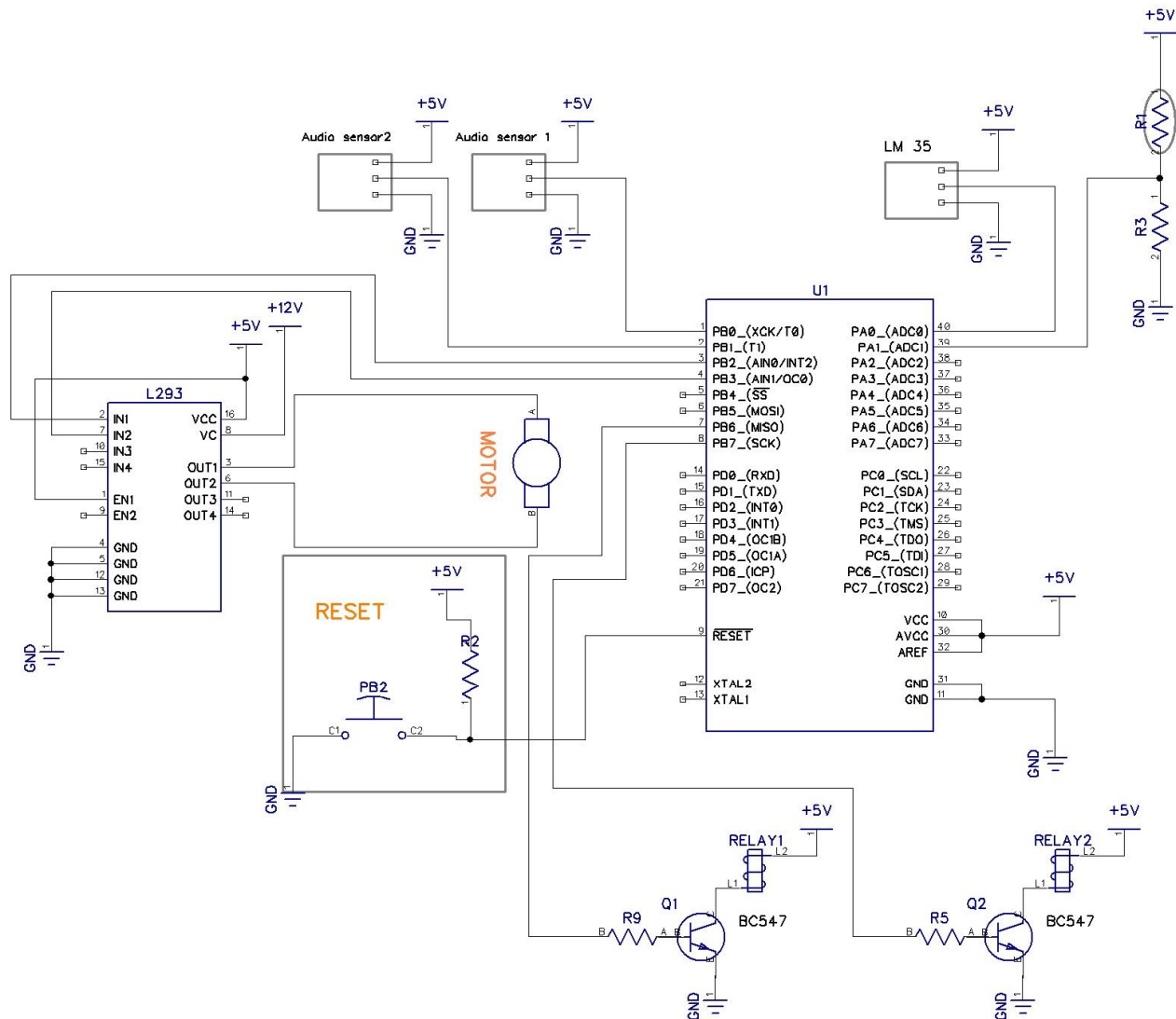


Fig. 2 Simulated Circuit Diagram

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VII. ADVANTAGES AND DISADVANTAGES

A. Advantages

Fully automated video conference room system.
Need of the human power in the remote field is reduced.
Video recording is automatically focused on person talking at present.
It can be used in point to point video conferencing.
Need of multiple camera is reduced.

B. Disadvantages

System become more complex if multipoint video conferencing is done.
If there is huge numbers of members and are compactly seated around table in conference.
Camera used should be high definition and self adjustable in big conference.
Failure of centre camera bring down whole system.

VIII. CONCLUSIONS

Design of smart automated video conference room system that automatically tracks the sound of current speaker by using the voice sensor and streams video on the server. To see conversion between conference rooms we must know the IP generated by raspberry pi module. System also controls the Temperature of the conference room using temperature sensor LM35 and Room Light of conference room using LDR.

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