Audio Rotating Camera Based on Speaker Voice

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Abstract— This paper gives an idea and the implementation of "Audio rotating camera based on speaker voice" project. The idea of this project came into our mind due the problems we faced in our first video conference. The problem was that we had to keep a person with the camera throughout the meeting to control the recording and it took almost an hour to set up every thing. That's why we have designed a system which can do all the process of recording automatically since this is an automatic system it takes less time than the manual one. As speaker person speak up the sound sensor will detect it and camera which is placed on the motor will rotate to that direction of the speaker.

Keywords: Speaker Person, Video Conferencing, Microphone, Camera, Conversation

I. INTRODUCTION

We know the problems related to the conventional video conferencing that is we need appoint a professional cameraman who can record the entire meeting. As this method is manual it takes much time than the automatic one. And also it is awkward to speak in front of the camera and the cameraman it seems like an interview rather than a meeting. That's why we have designed a system which will eliminate such kind of problems easily. In our system, it is not necessary to look at the camera, instead the speaker person can directly speak to the other person and so that our system is able to capture the natural conversation in between the meeting members. Our system is fully automatic hence this process will be done in some seconds.

II. BLOCK DIAGRAM AND DESCRIPTION

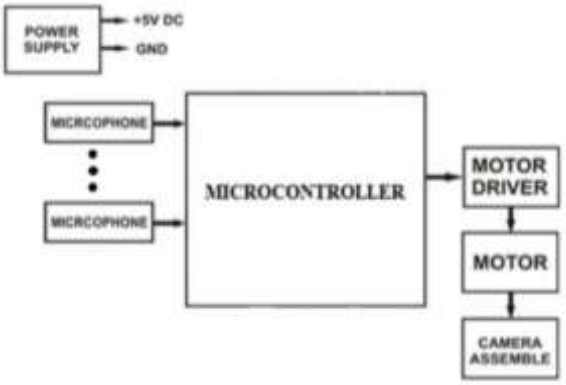

Fig. 1: Block diagram

A. Power Supply

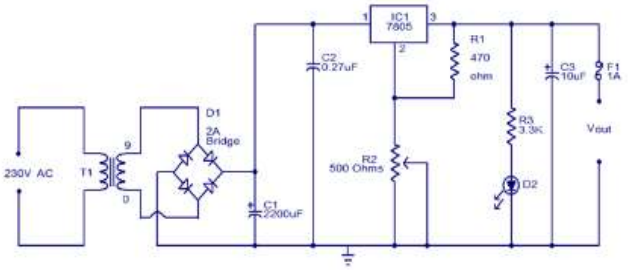

Fig. 2: Circuit diagram of power supply

Above circuit diagram shows how to make a 5V to 12V variable DC power supply from a fixed 5V regulator IC 7805. This is attained by using two resistors R1 and R2. By varying the POT R2 we can adjust the output voltage between 5V and 12V.

B. Microcontroller

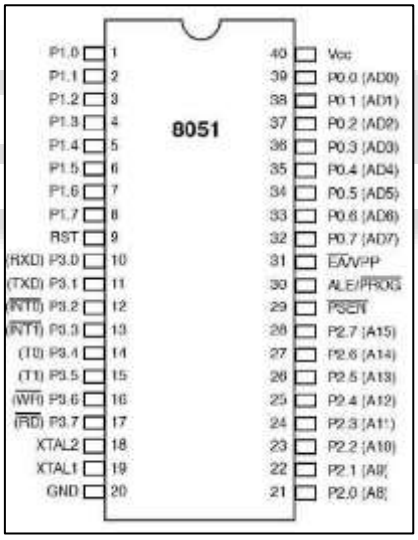

Fig. 3: Pinout diagram of microcontroller

This is the central processing unit of our system. It takes input from microphone, processes it and give it to the motor driver IC. We have used 8051 microcontroller, specifically AT89C51 because we have learned the 8051 microcontroller last semester and we are familiar with its architecture, its all ports and almost everything about it.

- 8-bit data bus and 8-bit ALU (Arithmetic and logic Unit)
- 4K bytes of Flash
- 128 bytes of RAM
- 32 I/O lines
- Two 16-bit timer/counters
- A five vector two-level interrupt architecture
- A full duplex serial port
- On-chip oscillator and clock circuitry.

C. Motor Driver

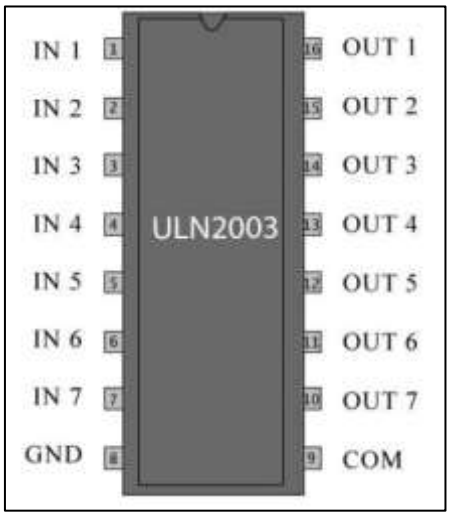

Fig. 4: Pinout diagram of motor drive

The microcontroller doesn't provide enough current to drive the motor so we need to use a current driver IC that is ULN2003A. ULN2003A is the array of seven NPN Darlington transistor pairs. Darlington pair is constructed by connecting two bipolar transistors to achieve high current amplification. In ULN2003A, 7 pins are input pins and 7 pins are output pins, two pins are for Vcc (power supply) and Ground. Here we are using four input and four output pins.

And another reason for which we have connected motor driver IC is that connecting motor directly to the microcontroller will be harmful for the microcontroller the reason is back EMF of the motor coil. Motor driver IC can provide protection to the microcontroller from the back EMF. We can also use L293D IC in place of ULN2003A for current amplification and back EMF protection.

- 500 mA rated collector current (single output)
- 50 V output (there is a version that supports 100 V output)
- Includes output flyback diodes
- Inputs compatible with TTL and 5-V CMOS logic

D. Motor

For the rotational control we have used a Unipolar stepper motor. Stepper motor is brushless DC motor, which can be rotated in small angles, these angles are called steps. Generally stepper motor use 200 steps to complete 360 degree rotation, means its rotate 1.8 degree per step. We can rotate stepper motor to any particular angle by giving it proper instructions.

Stepper motors are basically two types: Unipolar and Bipolar. Unipolar stepper motor generally has five or six wire, in which four wires are one end of four stator coils, and other end of the all four coils is tied together which represents fifth wire, this is called common wire (common point). Unipolar stepper motor is very common and popular because of its ease of use.

we can divide the working method of unipolar stepper motor in three modes: Wave drive mode, full step drive mode and half step drive mode. For our project we have used full step drive mode because this mode can produce high torque.

- Size: 42.3 mm square × 48 mm, not including the shaft (NEMA 17)
- Weight: 350 g (13 oz)
- Shaft diameter: 5 mm "D"
- Steps per revolution: 200.
- Current rating: 1.2 A per coil.
- Voltage rating: 4 V.
- Resistance: 3.3 Ω per coil.
- Holding torque: 3.2 kg-cm (44 oz-in)

E. Microphone

Several types of microphones are available in the market, but for our project we have chosen dynamic microphone because of their excellent reproduction capacity and also it can sense a very low magnitude of sound signal. The output of dynamic microphone is very low so we need feed this output to the amplifier and also we need to adjust the sensitivity of microphone according to the surrounding noise, there are a ready made sound detection senor module is available in the market.

This module detects whether the sound has exceeded a threshold value. Sound is detected via dynamic microphone and fed into an LM393 op-amp. The sound level setpoint is adjusted via an onboard potentiometer. When the sound level exceeds the setpoint, an LED on the module is illuminated and the output is sent low.

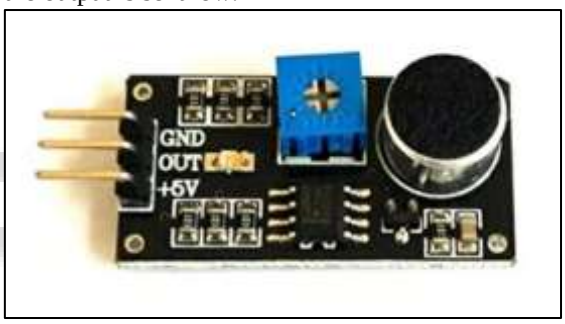

Fig. 5: Sound detection sensor module

- Main chip: LM393, electret microphone
- Working voltage: DC 4V ~ 6V
- Single signal output.
- Effective signal output for low level.
- Output low level and the signal light will on when there is a sound.

F. Camera

For our project we have used a action camera as a webcam because of its WIFI connectivity. Due to which camera can rotate easily without any problem unlike USB cable. This action camera is of 12MP.

- Model Name: Action Camera
- Video Capture Resolution: 720p
- Video Capture Format: MP4
- Lens Type: Wide-Angle
- Product Dimensions: 10.5 x 10.5 x 2cm; 530 Grams
- Display Size: 2 Inches LCD
- Flash Memory Type: Micro SD

III. FLOW CHART

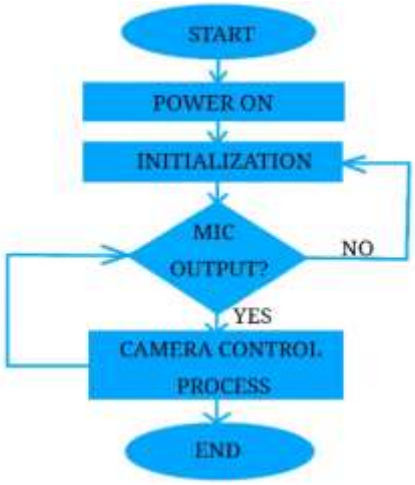

Fig. 6: Flow chart

IV. WORKING

To getting the sound input, we have used 4 microphones and for controlling the camera motion stepper motor with 4 steps is used. As the sound detected by any of the microphone that particular mic output goes low i.e. logic 0 and this change in the input is sensed by the microcontroller which is the main processing unit of our system and microcontroller will process this data as per the program and will give the output to the motor through driver IC which rotates the motor to that position of the speaker person where the microphone is installed.

V. CONCLUSION

As we have seen that our system work properly except some negligible issues. It is able rotate the camera to the direction of speaker person within some seconds and camera can capture the perfect visuals of the speaker. As we know the importance and necessity of remote conferencing in this on going pandemic, our system will play a major roll in the businesses and the other fields in this tough time.

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