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VOICE ACTIVATED PROGRAMMABLE MULTIPURPOSE ROBOT

V.NAGAMANI[1] SHANTI SWAROOP KAMPA[2] CH.SREEDHAR[3] SIDDARTH.G[4] A.RAKESH REDDY[5]

[1]ASSISTANT PROFESSOR,ECE, CHAITANYA BHARATI INSTITUTE OF TECHNOLOGY ,PRODDATUR
[2]ASSISTANT PROFESSOR,ECE, DR.KV.SRIT (DR.KV SUBBAREDDY INSTITUTE OF TECH).KURNOOL
[3]ASSISTANT PROFESSOR,ECE, GLOBAL INSTITUTE OF ENGINEERING AND TECHNOLOGY ,HYDERABAD
[4]B.TECH,ECE,VIDYA JYOTHI INSTITUTE OF TECHNOLOGY, HYDERABAD
[5]B.TECH,ECE,VIDYA JYOTHI INSTITUTE OF TECHNOLOGY, HYDERABAD

***ABSTRACT:** This paper introduces a systematic approach to design and implement a Real-time Voice Activated Programmable Multipurpose Robot. The robot's architecture consists of the following subsystems, namely Electronics subsystem and Software subsystem. Electronics subsystem gets a set of commands from software subsystem and generates control signals for the entire system. Software subsystem which is usually a computer provides easy to use interface for users which may be accepting commands like natural language sentences and translates it to low level commands which could be understood by machine (microcontroller or microprocessor). A voice recording IC APR9600 of non-volatile storage and playback capability is deployed in the system. This IC can be used in visitor guiding mode and patient guiding mode to play the voices stored. APR9600 can store 8 voices as we are using voice recorder IC in random access mode.*

A photoelectric sensor through opto-coupler is connected to the microcontroller to sense the obstacles in front of the robot and to take appropriate decisions The robot is controlled wirelessly using DTMF Decoder by dual tone multi frequency technique (DTMF). Two cell phones are used here one as transmitter and another as a receiver .The signal from the receiver cell phone headset is given to the IC HT9170B which decodes the dual tones and gives a binary data according to the key pressed in the transmitter cell phone. The receiver cell phone is kept in the robot. First a call is made from a transmitter cell phone. After the call gets activated in the receiver end we can control the robot through the transmitter cell phone.

Keywords: DTMF, IC, ROBOT, VOICE

I . INTRODUCTION TO EMBEDDED SYSTEMS:

An embedded system is an application that contains at least one programmable computer (typically in the form of a microcontroller, a microprocessor or digital signal processor chip) and which is used by individuals who are, in the main, unaware that the system is computer-based. Embedded systems incorporate microprocessor with in their implementation. The main purpose of the microprocessor is to simplify the system design and provide flexibility. This system may not have a disk driver and so the software is often stored in a ROM chip. Embedded systems often have several things to do at once.

Embedded systems are found in wide range of applications like expensive industrial control applications. As the technology brought down the cost of dedicated processors, they began to appear in moderately expansive applications such as automobiles, communications and office equipment, televisions. Today's embedded system is so inexpensive that they are used in almost every electronic product in our life.Frequently, an embedded system is a component within some larger system. For example, modern cars and trucks contain many embedded systems. One embedded system controls the anti-lock brakes, while the other monitors and controls the vehicle's emissions, and a third displays information on the dashboard. In some cases, these embedded systems are connected by some sort of a communications network, but that is certainly not a requirement.

Many embedded systems have to run 24 hours a day, it can't just "reboot" when something goes wrong. Also, unlike software designed for general-purpose computers, embedded software cannot usually be run on other embedded systems without significant modification. As a result, unnecessary circuitry is eliminated and hardware resources are shared wherever possible. For this reason a good coding practices and thorough testing take on a new level of realm of embedded processors.

2. Introduction to Robotics:

Robotics can be described as the current pinnacle of technical development. Robotics is a confluence science using the continuing advancements of mechanical engineering, material science, sensor fabrication, manufacturing techniques, and advanced algorithms. Robotics is the science and technology of robots, their design, manufacture, and application. Robotics requires a working knowledge of electronics, mechanics and software, and is usually accompanied by a large working knowledge of many subjects. The International Organization for Standardization defines a robot as "an automatically controlled, reprogrammable, multipurpose, manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications."A robot is a mechanical or virtual, artificial agent. It is usually an electromechanical system, which, by its appearance or movements, conveys a sense that it has intent or agency of its own.

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2.1 Block Diagram:

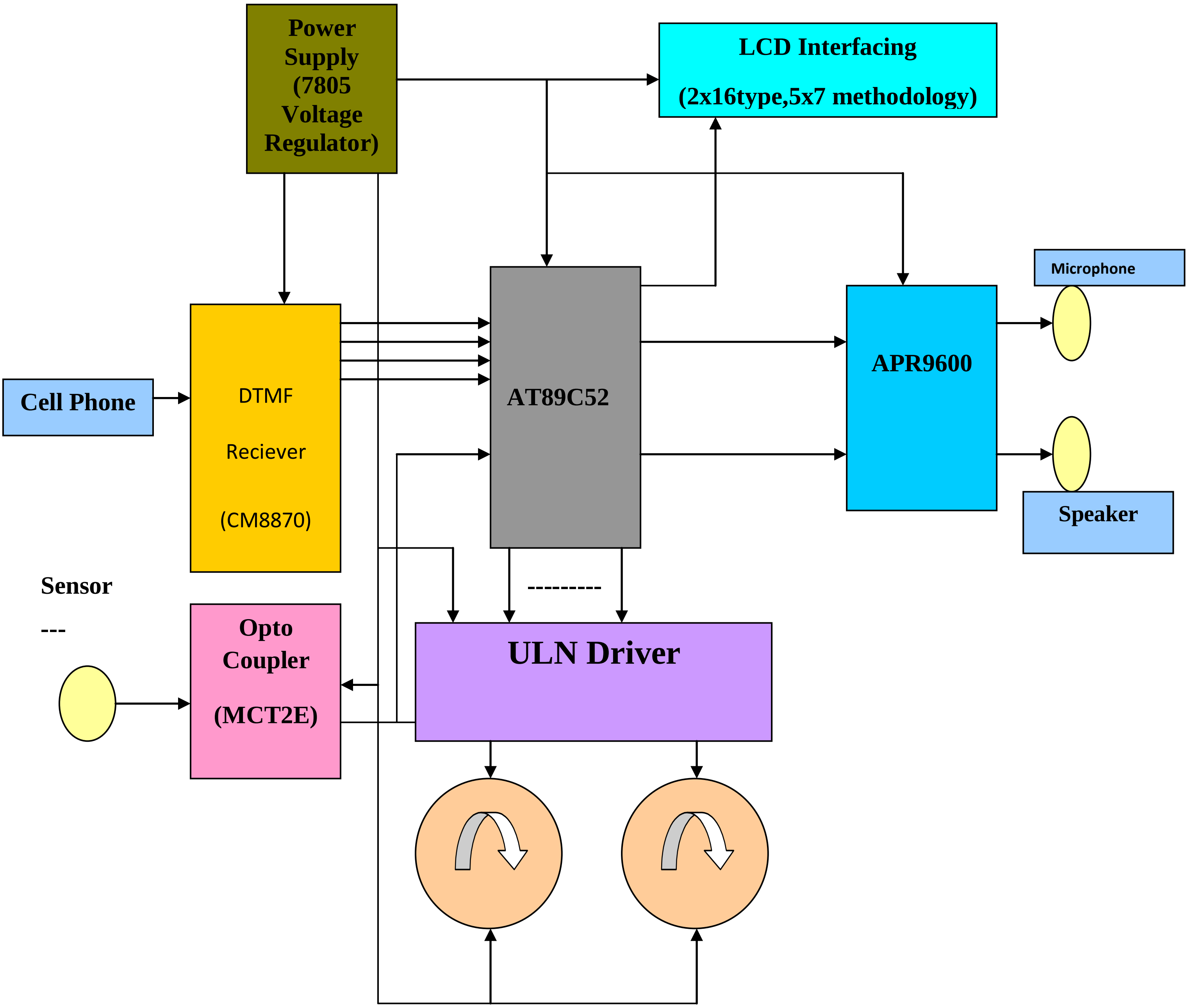


Fig 2.1 Block Diagram of voice activated programmable multipurpose robot

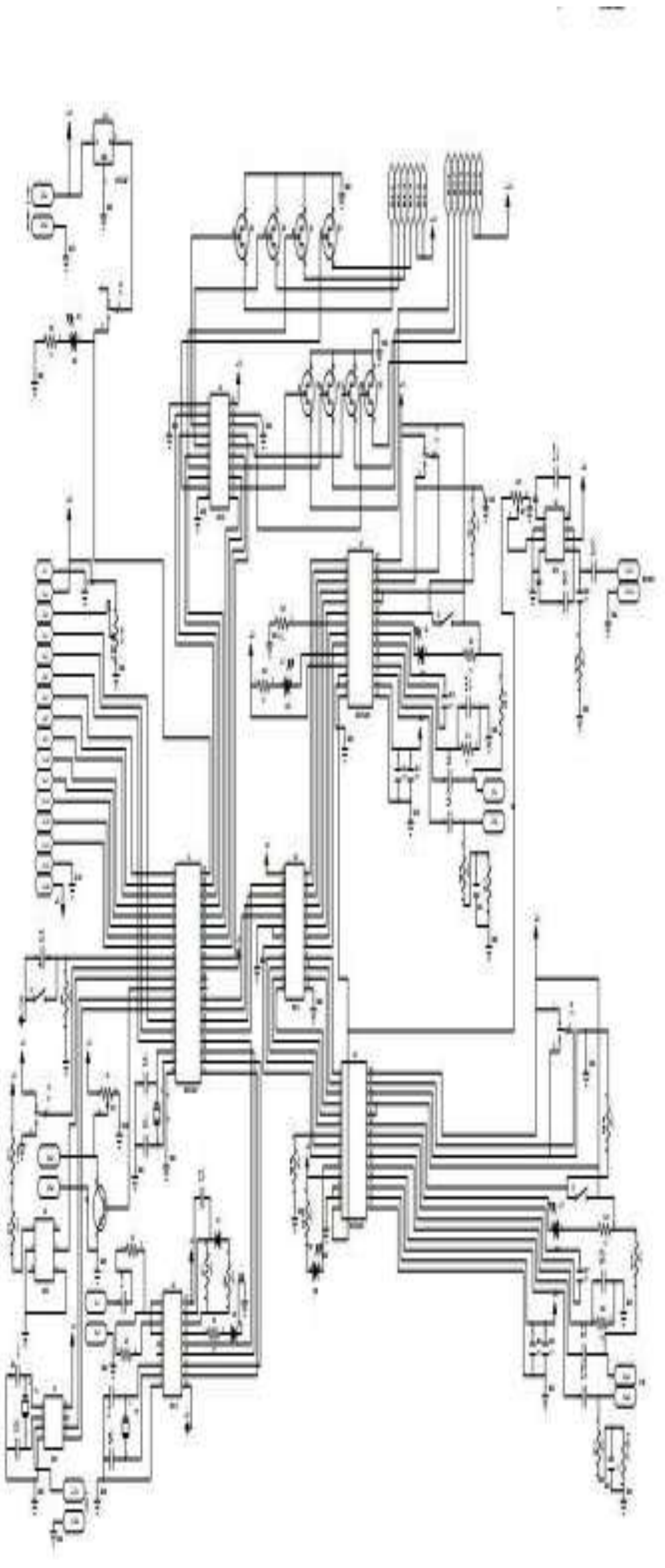


Fig 2.1.1 The circuit diagram for the robot is shown below.

2.1.2 Explanation of circuit diagram & operation:

The clock is generated for the microcontroller using a crystal of frequency 11.0592MHz connected to pins XTAL1 and XTAL2. A 6V battery is connected to a 7805 voltage regulator. The regulated output is given as supply to the microcontroller and all the other IC'S used.

PORT0 of microcontroller AT89C51 is connected to input of buffer 74HC244. The buffer is used to isolate the microcontroller and the stepper motor. The output of buffer is given to IRF 540N, a FET to provide the necessary current to drive the stepper motor. The power supply for the stepper motor is from a 12V battery.

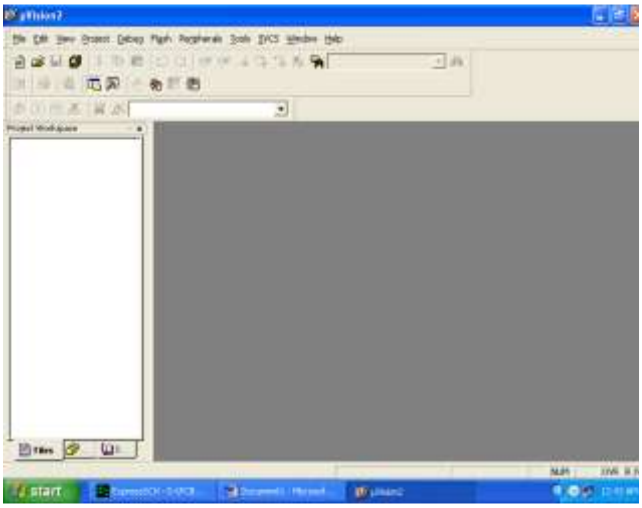
PORT1 of the AT89C51 is connected to a multiplexed seven segment display system. The seven segment displays used here are common anode displays. Each pin of upper nibble in PORT1 is connected to a transistor BC547 which selects one of the 7-segment displays. The lower nibble is connected to IC 4511 a common anode BCD to seven segment decoder which converts the BCD data to seven segment data and then give it to the seven segment displays. These displays are used for the user to set the time, distance to be traveled, display time, display distance to be traveled, etc. In PORT2 the lower nibble is connected to a 4 x16 decoder. The decoder outputs select which voice is to be played in APR9600's.

The APR9600 device offers voice recording, non-volatile storage and playback capability. APR 9600 can store 8 voices because we use voice recorder IC's in random access mode. The duration of each voice is 7.5 seconds. We use these two voice recorder IC's in visitor guiding mode and patient guiding mode to play the voices stored. In the upper nibble pin P2.4 is connected to a photoelectric sensor through an opto-coupler IC MCT2E which senses the obstacles in front of the robot. When the sensor senses the object it gives logic one to the controller. The pin P2.5 is connected to a buzzer. In PORT3 the pins P3.3-P3.6 are connected to push to on switches which are used for giving input such as directions, distance and time to the robot. The port pins P3.2 and P3.7 are connected to the SDA and SCL pins of the real time clock IC DS1307 respectively.

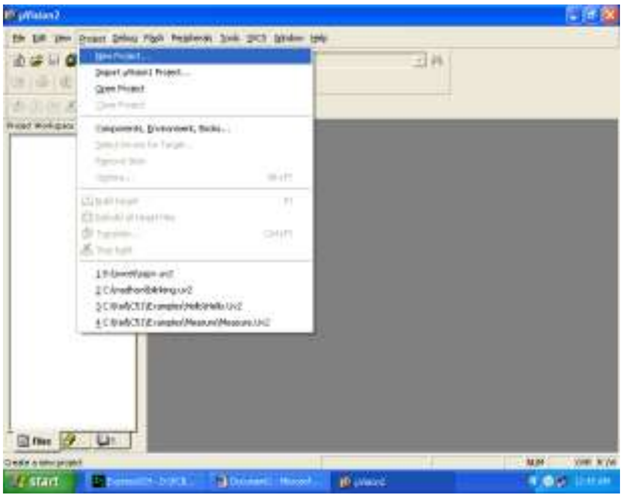
The microcontroller communicates with DS1307 through I2C logic. We read the time from the real time clock and we can set the time in the patient guiding mode. The robot is controlled wirelessly using the IC CM8870 by dual tone multi frequency technique (DTMF). Two cell phones are used here one as transmitter and another as a receiver .The signal from the receiver cell phone headset is given to the IC CM8870 which decodes the dual tones and gives a binary data according to the key pressed in the transmitter cell phone. The receiver cell phone is kept in the robot. First a call is made from a transmitter cell phone. After the call gets activated in the receiver end we can control the robot through the transmitter cell phone.

3. Source Code

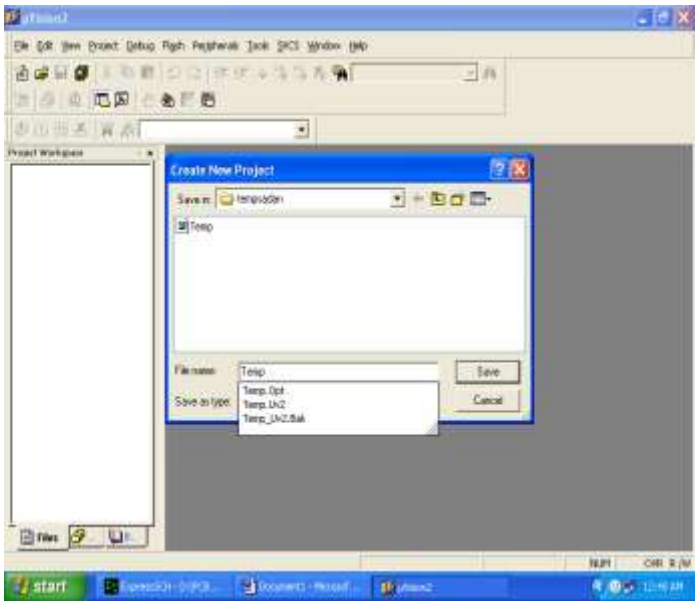
1. Click on the Keil uVision Icon on Desktop
2. The following fig will appear



3. Click on the Project menu from the title bar
4. Then Click on New Project

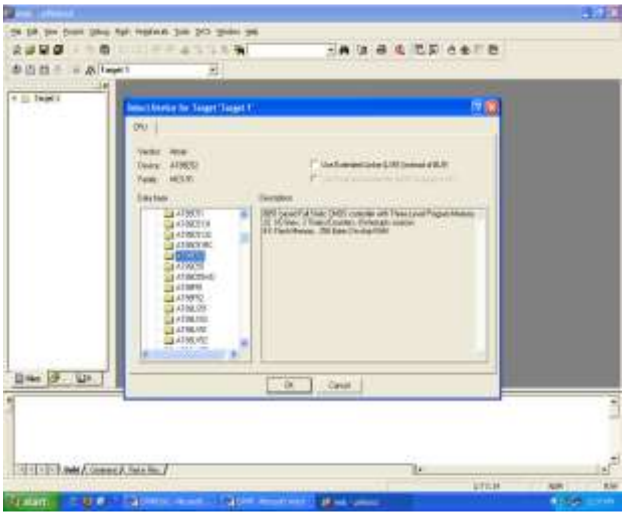


5. Save the Project by typing suitable project name with no extension in u r own folder sited in either C:\ or D:\



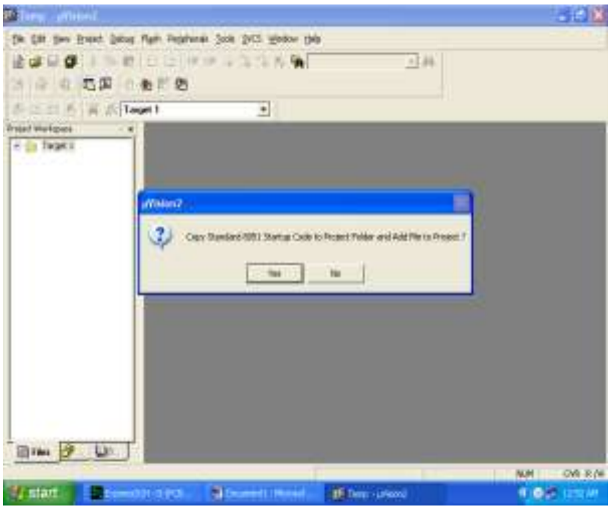
6. Then Click on Save button above.
7. Select the component for u r project. i.e. Atmel……
8. Click on the + Symbol beside of Atmel

9. Select AT89C52 as shown below



10. Then Click on "OK"

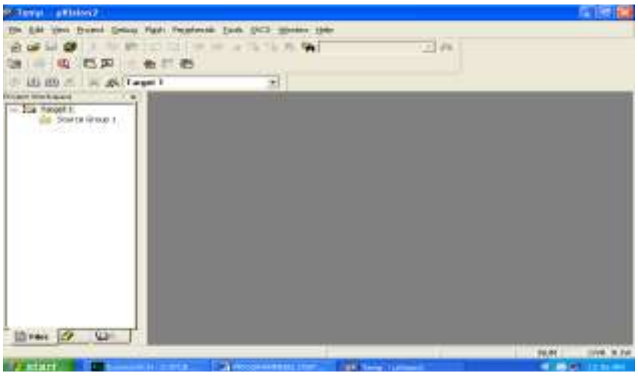
11. The Following fig will appear



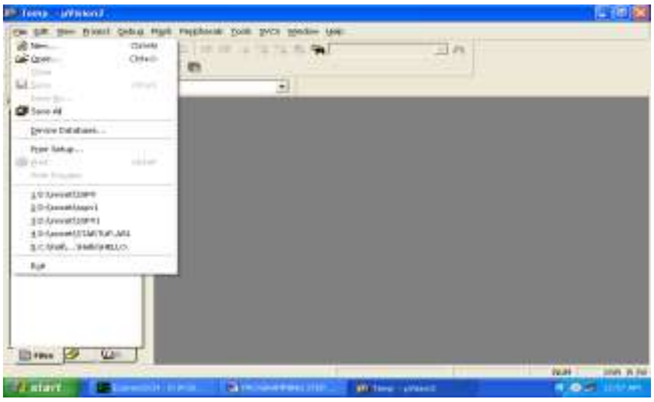
12. Then Click either YES or NO………mostly "NO"

13. Now your project is ready to USE

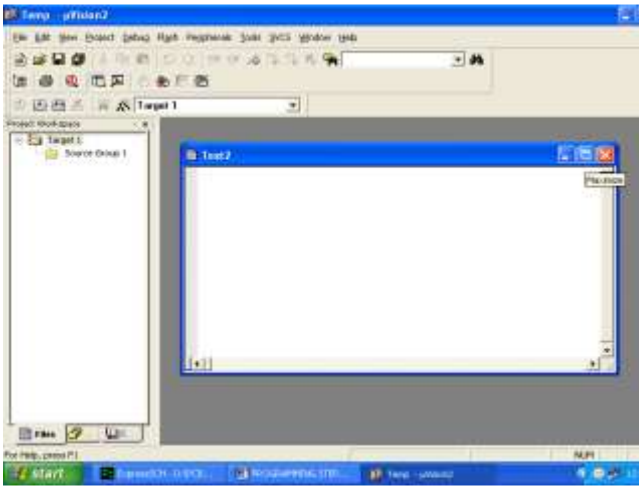
14. Now double click on the Target1, you would get another option "Source group 1" as shown in next page.



15. Click on the file option from menu bar and select "new"



16. The next screen will be as shown in next page, and just maximize it by double clicking on its blue boarder.



17. Now start writing program in either in "C" or "ASM"

18. For a program written in Assembly, then save it with extension ". asm" and for "C" based program save it with extension " .C"

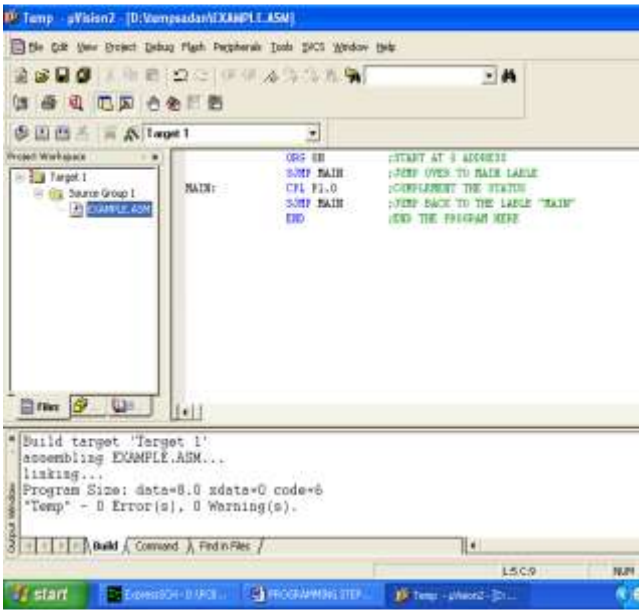
19. Now right click on Source group 1 and click on "**Add files to Group Source**"

20. Now you will get another window, on which by default "C" files will appear.

21. Now select as per your file extension given while saving the file

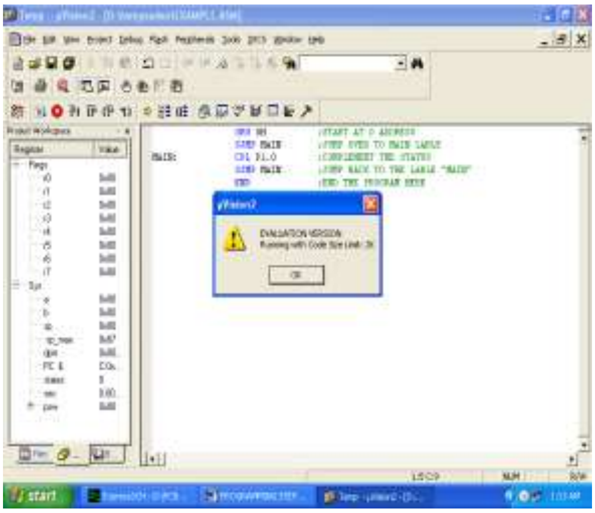
22. Click only one time on option "**ADD**"

23. Now Press function key F7 to compile. Any error will appear if so happen.



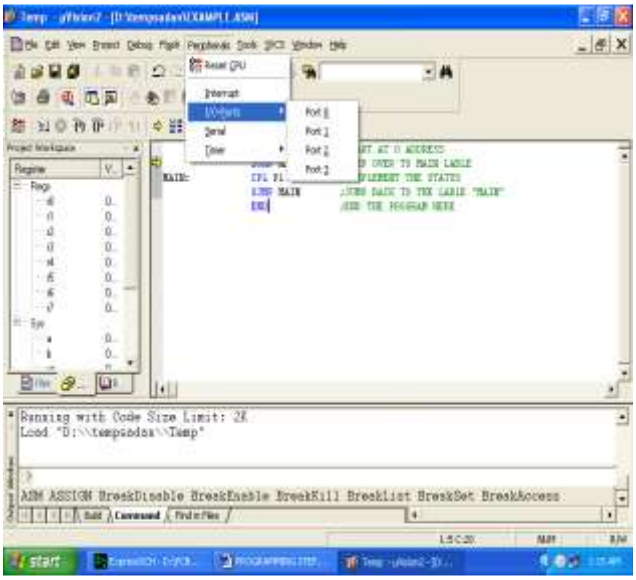
24. If the file contains no error, then press Control+F5 simultaneously.

25. The new window is as follows

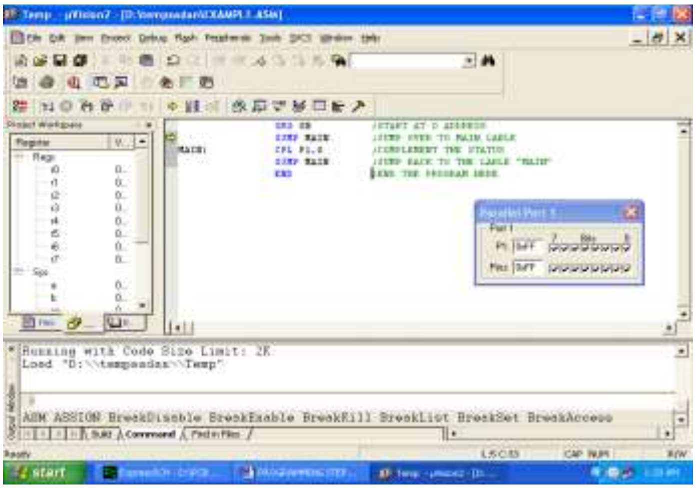


26. Then Click "OK"

27. Now Click on the Peripherals from menu bar, and check your required port as shown in fig below



28. Drag the port a side and click in the program file.



29. Now keep Pressing function key "F11" slowly and observe.

30. You are running your program successfully

4. Conclusions:

This paper work titled "Voice Activated Robot" has been developed from the basic idea of designing a completely automated system possessing reprogram ability feature, to meet the industrial and real time applications, and can work in any situations, with maximum efficiency and more life time.

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As discussed earlier the robot emulates biomorphic properties to a certain extent. The basic working principles of communications for sensor properties and stepper motor are thoroughly studied prior to their application in the paper work.

The locomotive ability is provided using a small range stepper motor is used and the wheels are directly coupled to the shaft of stepper motor because it's a demo. But in practice suitable gear mechanism should be designed to drive the huge bodies and a larger rating stepper has to be employed. Also here in the demo module, as we embedded a voice activated chip [APR9600] which plays the role of alarm by intimating, when the robot faces an obstacle. But the response can be made intelligent using proper technology. Also the scope of using robots to help disabled people is enhanced by vocal programmable multifunctional robot. The programmable feature of also allows for mass production and to personalize it according to one's ease, thus providing a reliable source of assistance. The overall module is completely tested and trail run; results found satisfactory.

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6. Authors Biography:

V.NAGAMANI[1] working as an ASSISTANT PROFESSOR in chaitanya bharati institute of technology ,proddatur.herareasofresearchinterestsincludeWireless&Mobilecommunications,Digitalsignalprocessing,Imageprocessing,Telecommunications, communication systems, Signal processing, embedded systems, network security

SHANTI SWAROOP KAMPA[2] is working as an Asst.professor in Department of Electronics and Communication Engineering at DR.KV.SRIT (DR.KV SUBBAREDDY INSTITUTE OF TECH). He completed M.Tech (VLSI) from Rashtrasant Tukadoji Maharaj Nagpur University and B.Tech (ECE) from Sri Krishna deveraya University, ANANTAPUR. His area of research includes Digital Image Processing, Embedded systems, Wireless mobile communications

CH. SREEDHAR[3] is from **HYDERABAD, ANDHRAPRADESH.** Completed **M.TECH** in **ECE** with specialization **(VLSI SYSTEMS DESIGN)** from Kshatriya college of engineering affiliated by **JNTUH** in 2011and **B.TECH** in **ECE** from Aizza College of Engineering & technology affiliated by **JNTUH** in 2006. Currently he is working as an **Assistant professor** in **ECE** department at Global Institute of Engineering & Technology, Hyderabad from 2007.**His areas of research interests includeWireless&Mobilecommunications,Digitalsignalprocessing, Imageprocessing, Telecommunications, communication systems, Signal processing, embedded systems, network security.**

SIDDARTH.G[4] is from hyderabad, presently he is final year student of vidya jyothi institute of technology,aziz nagar,ECE branch. HIS areas of research interests are include VLSI DESIGN, EMBEDDED SYSTEMS, AND COMMUNICATION SYSTEMS.

A.RAKESH REDDY[5] is from hyderabad, presently he is final year student of vidya jyothi institute of technology,aziz nagar,ECE branch. HIS areas of research interests are include VLSI DESIGN, EMBEDDED SYSTEMS, AND COMMUNICATION SYSTEMS.