

# Robotic Ambulance for Emergency Medical Service in Smart Cities

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**ABSTRACT:** Robotic systems are one of the key solutions for providing smart services. Time is a critical issue when dealing with people who experience a sudden cardiac arrest that unfortunately could die due to inaccessibility of the emergency treatment. Therefore, an immediate treatment using Automated External Defibrillator (AED) must be administered to the victim within a few minutes after collapsing.

**KEYWORDS:** ECG Sensor, IR Sensor, Pic Controller, Gps/Gsm, LCD.

## I. INTRODUCTION

The concept of high-tech machines that can serve the people well or relieve humans of tiresome chores has been an object of human imagination. A mobile robot would be able to travel throughout the environment and can put their position wherever its condition. Mobile robot is an autonomous or semi autonomous machine that capable to move around in their environment and also can perform various tasks either with direct or partial control by human supervision or completely autonomous.

With using multiple sensors for navigation, this robot is able to navigate from a point to a given destination without losing the correct path or hitting obstacles.

## II. LITERATURE SURVEY

In the paper H. Ning *et al.*, "From Internet to smart world," *IEEE Access*, vol. 3, pp. 1994-1999, Oct. 2015., the system uses an transducer and a microprocessor-based circuit to record blood pressure and heart rate. It also uses as a new method to measure blood pressure without unnecessary constriction of the patient's limb. They used the M2M technologies and GPS/GSM module, which operates usually under M2M platform. It makes use of a cellular phone for voice and data communications, a GPS receiver for location tracing.

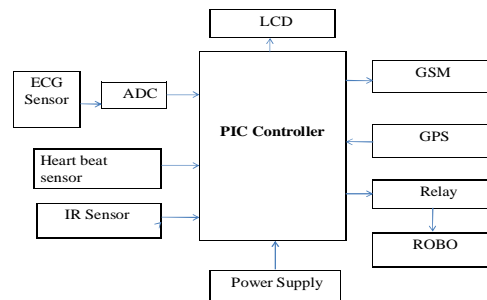
## III. EXISTING METHOD

In smart cities, due to traffic, sometimes ambulance will not reach the emergency spot on time, it may causes death. It takes more response time. To overcome these problems, ambulance robot is used.

## IV. PROPOSED METHOD

The proposed ambulance robot for smart cities provides the service of ambulance with AED to help someone having a cardiac arrest. No need to wait for the ambulance to give first aid solutions. An emergency message and current position of victim will be generated. Message can be sent to the family members regarding current situation of the victim. It can be operated in auto or manual mode.

## V. BLOCK DIAGRAM



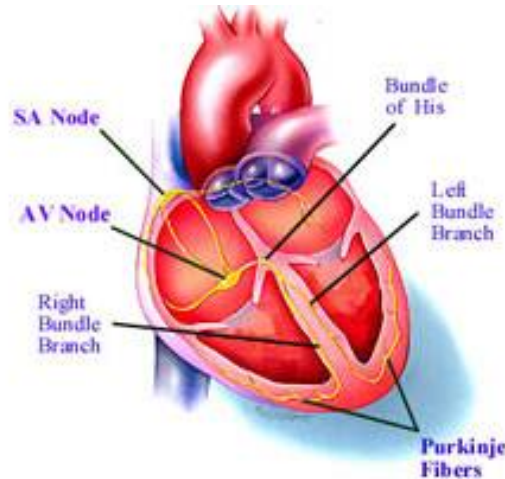
## VI. HARDWARE USED

### A. PIC CONTROLLER

The PIC16F877A CMOS FLASH-based 8-bit microcontroller is upward compatible with the PIC16C5x, PIC12Cxxx and PIC16C7x devices. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital(A/D)converter, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port. Program Counter (PC) keeps track of the program execution by holding the address of the current instruction. It is automatically incremented to the next instruction during the current instruction execution. The PIC16F87XA family has an 8-level deep x 13-bit wide hardware stack. The stack space is not part of either program or data space and the stack pointer is not readable or writable. In the PIC microcontrollers, this is a special block of RAM memory used only for this purpose. The CALL instruction is used to jump to a subroutine, which must be terminated with the RETURN instruction. CALL has the address of the first instruction in the subroutine as its operand. When the CALL instruction is executed, the destination address is copied to the PC. The PC is Pushed onto the stack when a CALL instruction is executed, or an interrupt causes a branch. The stack is Popped in the event of a RETURN, RETLW or a RETFIE instruction execution.

### B. ECG

An **electrocardiogram** (ECG or EKG, abbreviated from the German *Elektrokardiogramm*) is a graphic produced by an **electrocardiograph**, which records the electrical activity of the heart over time. An electrocardiogram (ECG / EKG) is an electrical recording of the heart that measures the electrical activity of the heart. This activity reflects the action of the cardiac muscle as it depolarizes and repolarizes during the cardiac cycle. The ECG represents the temporal and spatial summation of the action potentials of the myocardial fibers typically measured with body-surface electrodes. It is the gold standard for the diagnosis of cardiac arrhythmias.



The heart is a muscular organ that beats in rhythm to pump the blood through the body. The human heart has four chambers, upper two atria and lower two ventricles. The pumping action is due to the contraction of the heart musculature which is initiated by action potentials emanating (72 beats/min) from the sinoatrial node. The sinoatrial (SA) node, is the natural pacemaker of the heart. These special autorhythmic cells initiate the action potentials that cause contraction. They start the action potential spreading through the atria.

The action potentials spread along the surface of the atria toward the atrioventricular junction where the atrioventricular (AV) node is situated. The atrioventricular node, situated at the base of the septum, allows the potentials started by the SA node to spread to all parts of the ventricles from the interior to the exterior of the ventricular musculature by the bundle of His. The bundle of His (atrioventricular bundle) starts at the AV, divides into left and right branches which follow the septum and curve around to the outer walls. Purkinje fibers extend from the bundle of His. These help spread the action potential rapidly through the ventricle.

### **C. GSM**

GSM stands for Global System for Mobile Communication and is an open, digital cellular technology used for transmitting mobile voice and data services. The GSM emerged from the idea of cell-based mobile radio systems at Bell Laboratories in the early 1970s. The GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard. The GSM standard is the most widely accepted standard and is implemented globally. The GSM is a circuit-switched system that divides each 200 kHz channel into eight 25 kHz time-slots. GSM operates in the 900 MHz and 1.8GHz bands in Europe and the 1.9GHz and 850MHz bands in the US. The GSM owns a market share of more than 70 percent of the world's digital cellular subscribers.

The GSM makes use of narrowband Time Division Multiple Access (TDMA) technique for transmitting signals. The GSM was developed using digital technology. It has an ability to carry 64 kbps to 120 Mbps of data rates. Presently GSM support more than one billion mobile subscribers in more than 210 countries throughout of the world. The GSM provides basic to advanced voice and data services including Roaming service. Roaming is the ability to use your GSM phone number in another GSM network.

A GSM digitizes and compresses data, then sends it down through a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1,800 MHz frequency band.

### **D. RELAY**

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a

circuit by a low-power signal or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits, repeating the signal coming in from one circuit and re-transmitting it to another. Relays were used extensively in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching.

### E. LCD

LCD is a type of display used in digital watches and many portable computers. LCD displays utilize to sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them. LCD technology has advanced very rapidly since its initial inception over a decade ago for use in lap top computers. Technical achievements has resulted in brighter display, higher resolutions, reduce response times and cheaper manufacturing process. The liquid crystals can be manipulated through an applied electric voltage so that light is allowed to pass or is blocked. By carefully controlling where and what wavelength (color) of light is allowed to pass, the LCD monitor is able to display images. A backlight provides LCD monitor's brightness. Over the years many improvements have been made to LCD to help enhance resolution, image, sharpness and response times. One of the latest such advancement is applied to glass during acts as switch allowing control of light at the pixel level, greatly improving LCD's ability to display small-sized fonts and image clearly.

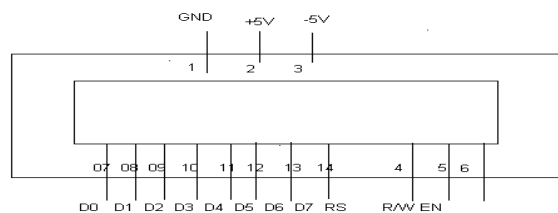


Figure 1.Pin Diagram Of Lcd

### F. POWER SUPPLY

#### 6.6.1 Power supply block consists of following units:

Step down transformer, Bridge rectifier circuit, Input filter, Voltage regulators, Output filter, Indicator unit. The step-down transformer is used to step down the supply voltage of 230v ac from mains to lower values, as the various IC's used in this project require reduced voltages. A diode bridge is an arrangement of four diodes connected in a bridge circuit. That provides the polarity of output voltage of any polarity of the input voltage. When used in its most common application, for conversion of alternating current (A.C) input into direct current (D.C) output, it is known as a bridge rectifier. Capacitors are used as filters. The ripples from the dc voltages are removed and pure dc voltage is obtained. The primary action performed by capacitor is charging and discharging.

## VII. SOFTWARE DESCRIPTION

### A. EMBEDDED C

**Embedded C** is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features

such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware addressing. Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, data type declaration, conditional statements (if, switch, case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc.

## **B. KEIL**

Keil Software is the leading vendor for 8/16-bit development tools (ranked at first position in the 2004 Embedded Market Study of the Embedded Systems and EE Times magazine). Keil Software is represented world-wide in more than 40 countries. Since the market introduction in 1988, the Keil C51 Compiler is the de facto industry standard and supports more than 500 current 8051 device variants. Now, Keil Software offers development tools for ARM. Keil Software makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, and evaluation boards for the 8051, 251, ARM, and XC16x/C16x/ST10 microcontroller families. Keil Software is pleased to announce simulation support for the Atmel AT91 ARM family of microcontrollers. The Keil  $\mu$ Vision Debugger simulates the complete ARM instruction-set as well as the on-chip peripherals for each device in the AT91 ARM/Thumb microcontroller family. The integrated simulator provides complete peripheral simulation. Other new features in the  $\mu$ Vision Debugger include: An integrated Software Logic Analyzer that measures I/O signals as well as program variables and helps developers create complex signal processing algorithms. An Execution Profiler that measures time spent in each function, source line, and assembler instruction. Now developers can find exactly where programs spend the most time.

"Using nothing more than the provided simulation support and debug scripts, developers can create a high-fidelity simulation of their actual target hardware and environment. No extra hardware or test equipment is required. The Logic Analyzer and Execution Profiler will help developers when it comes time to develop and tune signaling algorithms." said Jon Ward, President of Keil Software USA, Inc.

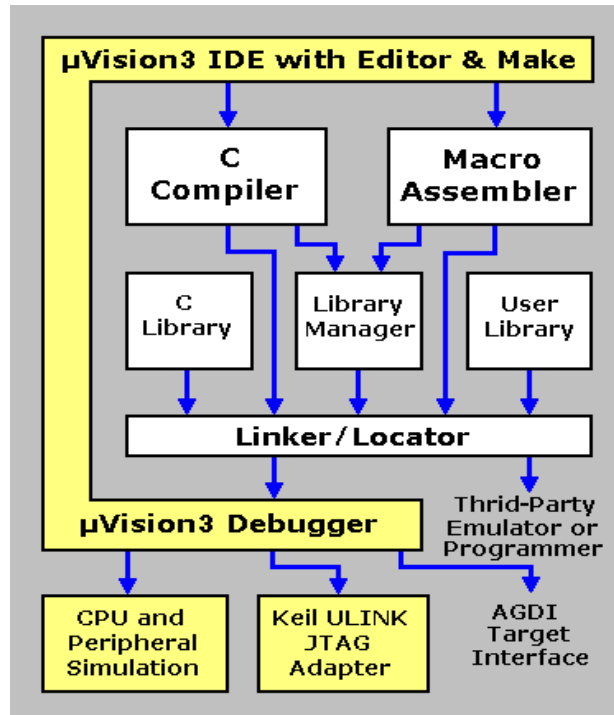


Figure 2. Block Diagram Of µvision3 Ide

## VIII. ADVANTAGES

- Used in many different ways to find and save the victims in a faster and more efficient way.
- It is designed to do rescuing jobs in situations that are hazardous for mankind to handle it, for instance rainstorms, collapsed buildings, obstructions, and dangerous substances.

## IX. CONCLUSION

In this paper, we presented a usage of smart vehicle for smart city which can be implemented to intelligent vehicles based on their architecture using a simple sequence of three steps: sense, plan, and act (SPA). Some of that technology has readily available on the market today and the rest of them are still on the investigation step to guarantee safe and reliable operation

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