ARM Cortex M3 based Collision Detection System

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Abstract - *This document specifies about the centralized patient This document describes about the ARM cortex M3 based collision detection system with the help of GPS navigating system using ADXL sensor .*

***Key Words**: ARM, Sensor and GPS.*

1. INTRODUCTION

ARM cortex M3 based collision detection system is used mainly used to detect the collision and with the help of GPS(Global Positioning System) and sends the location of the collision as soon as it detects collision and releases the air bag with the help of sensors .The cost is reduced and has much more security and alarming facility . The collision detection algorithm compute the pair of involved objects, area of contact, depth of penetration and angle of penetration.

ARM (Advanced Risc Machine) is the best as it is used in consumer electronic devices because of their reduced instruction set, few transistors, small size, low power consumption and reduced complexity[1].

Arm V7 processors consist of two operation they are:

1. Program mode

2. Run mode

Program mode – it is the first mode that program mode is used to dump the program to the ARM 7 processors from external device for example computer etc.

Run mode – it is used for the execution of program .For example run mode is used for the accident detection operation When accident occurs the noise is created in ADXL Sensor which will change the angle of x coordinate and give the signal as analog output.

There are 3 types of pins in sensor

• X coordinate

• Read

• Write

X coordinate used for change of the angle through indication.

 Read pin used for information When the ARM processor reads the signal from the sensor it will show the accident has been occurred in certain place with the help of GPS .Hence by using the sensor GPS is used to find the location and information is directly send through the mobile.

I.   ARM with LPC2148

It is 32 bit ARM V7 based on LPC1768 microcontroller with real time emulsion and trace support it has been the high speed flash memory form 32 bit to 512kb bit memory. It has unique accelerator with high clock rate.

II.   GPS

 GPS (Global Positioning System) it is based on navigation system it will provide navigation and timings GPS provides proper location and information to the people who are need for it to find weather forecast, time, day and night anywhere in the world

GPS are made up of 3 things

• Control and monitoring stations

 • User owned by the GPS receivers

• Satellite are also made up of GPS

GPS receivers

a. Speed, directions, time, distance are used by GPS to find out.

 b. To locate 3D space 3 satellite are used to set up.

c. To find the timing the 4th satellite will be used.

d. Sub-centimeter scale is used for finding positions.

The role of GPS is to track vehicles and trapped the signal and it will be send though the mobile to confirm that vehicle

III.   SENSOR

A sensor is very small in size but it is the main object to detect. Signal consist of 3 axis accelerometer voltage to find output. To find the gravity the user will select the band width to till sensing. As the result it will get the application as dynamic acceleration which will be in the form of vibration and also shock resistance.

Nowadays most of the industries use robotic vehicles to

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carry out their most of the task in order to automate processes and to save their time and also to avoid many expenses.

In order to make the robotic vehicle free from collision, here we propose a collision detector robotic vehicle as shown in figure below and that is not only capable to detect obstacles but also avoid collisions.

Here we use ultrasonic sensor with arm controller to achieve this purpose.
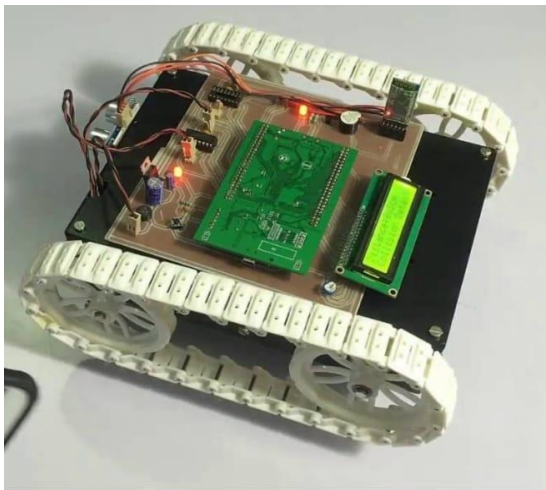
Figure(a):

The above project (circuit figure (a))

consists of Hardware specification, STM32F103C8T6, Robotic chassis HC-SR04 ultrasonic, Bluetooth Module, DC motor, Motor driver IC, voltage regulator IC, IC socket, LCD display, crystal oscillator, Resistors, capacitors, Transistors, cables and connectors, Diodes, PCB and Bread boards, LED transformer/ Adapter, push buttons and Switch IC[2].

The STM32F103C8T6 is actually a medium density performance line, The ARM cortex- M3 32 bit microcontroller in 48 pin LQFP package. It incorporates high performance RISC core with 72Mhz operating frequency, high speed embedded memories, extensive range of enhanced I/O and peripherals connected to two APB buses. Robotics chassis HC-SR04 ultrasonic is the epitome of robotics is obstacle detection and avoidance, with a simple HC-SR04 sensor, you can detect objects with using ultrasonic waves(sound)[3].

A Bluetooth Module could also be the hardware component which would provide a wireless product to work with the computer or Bluetooth may be an accessory and can be used in SPP(Serial Port Protocol) module, designed for transparent wireless serial connection setup.

Crystal oscillator is actually the electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of

piezoelectric material to produce or make an electrical signal with a precise frequency. An LED transformer is a type of power supply for LED lighting system and as a result, an LED transformer can power larger and longer lighting systems[4].

IV.   BLOCK DIAGRAM
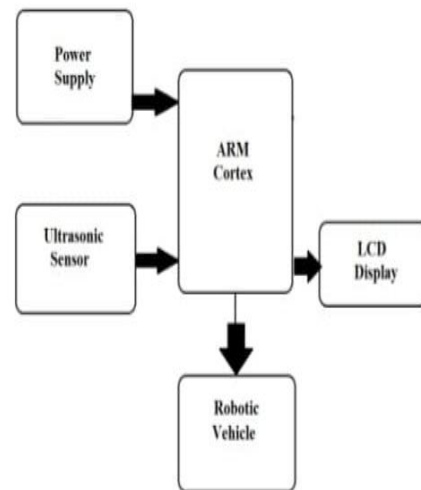
Fig(b):represents the block diagram of collision detection based on ARM Cortex-M3.
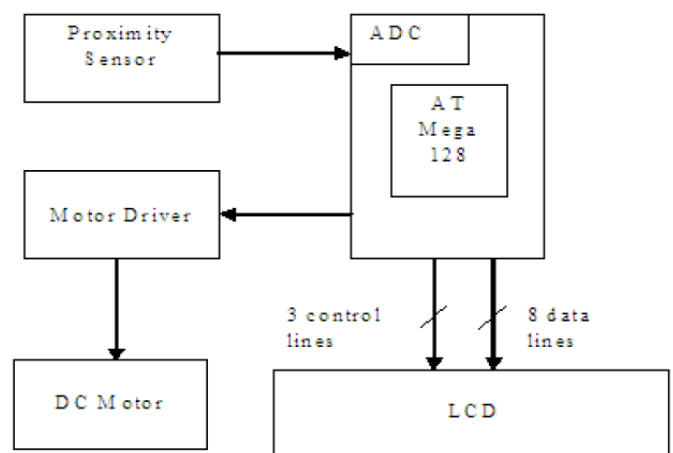
Fig(c): represents the block diagram of the collision detection based on the AVR microcontroller

The block diagram consists of 6 blocks as shown in figure (c)[5]. The blocks are proximity sensor, DC, ATmega board, DC motor, LCD and motor driver.

All the blocks on a single chip they communicate with external world through sensor array with it's very first block.

Analog input will be processed by ADC in AT mega board.

Motor driver is used to check the proper functioning of the DC motor and this circuits takes the correct control lines and data lines and also takes the output from the ports of ATmega board and helps to drive the motor connected to the DC motor. The signal coming out of the ATmega 128 controller are not enough to drive the motor so for such cases the motor driver is used to drive the DC motor. LCD is used to display the activation of the motor such as like whether the motor is running or stopping or the motor is rotating the clockwise or anticlockwise and display in LCD according to the operation of the motor[6]. Here we used proximity sensor which is used to detect the low range collision and gives the information to the ADC, ATmega 128 board[7].

Microcontroller selection usually requires the sufficient processing speed either input or output control lines and adequate memory for running the entire program and additional serial ports, timers, counters, PWM etc[8]. Here we use AVR ATmega 128 controllers and it is a 8 bit controller and it works based on advance RISC architecture and it is highly non-volatile memory segment and it also has a special feature like power-on reset, internal calibrated RC oscillator, external and internal interrupt sources, six sleep modes, ADC noise, Reduction, power-save, power-down standby , extended standby and software selectable clock frequency etc.In this block diagram(figure c) we can use any type of sensor based on the design application and the selection of the ADC is according to the sensitivity we required like 10,12,16 bits. ATmega 128 board is used as controller in this block diagram(figure c)[9].

APPLICATIONS

a. Ambulance

b. Cars

c. Security

d. Fire engines

e. Police station

f. Defence

V.   ADVANTAGES

1)Operating the system is easy.

2) Simple to perform the task.

3) It isolate GPS signal.

4) Security is compulsory

2. CONCLUSION

The ARM cortex based collision detection system is done by using these above mentioned components and by the use of sensor we can even locate the collision detected place with the help of GPS and track the person.

ACKNOWLEDGEMENT

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BIOGRAPHIES

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