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Design And Construction Of Mems Accelerometer Based Tilt Operated Touch Free Mobile Phone Using Arm-7.

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Abstract:

This project aims at designing a GSM mobile with the help of a MEMS ACCELE ROMETER SENSOR to help for a friendly hardware interaction for the user. The device is designed by interfacing a Micro Electro Mechanical System (MEMS ACCELE ROMETER SENSOR) and a GSM modem. An onboard computer (ARM-7 LPC2148 microcontroller) controls these two hardware modules. These three combined to form the project that can achieve the following innovative features

OVER VIEW OF EMBEDDED SYSTEMS Project Overview:

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.

Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. The design of MEMS based tilt operated touch free mobile phone using ARM-7 LPC2148 Microcontroller is an exclusive project that can interfaces with MEMS ACCELEROMETER SENSOR based tilt sensor and also with GSM Modem, the information about the tilt in different directions is given by the MEMS accelerometer sensor.

Thesis Overview The thesis explains the implementation of "Design and construction of MEMS based tilt operated touch free mobile phone" using

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ARM-7 LPC2148 microcontroller. The organization of the thesis is explained here with:

Literature Survey:

Nowadays, embedded technology has become an integral part of routine life with respective to the data transmitting and receiving matters. Embedded systems have become an essential aspect in various applications, such as automation and controlling of devices, including real time systems such as aiding security and data transmission. An important step in information technology is combining the networks a computers with everyday devices.

Communication in embedded systems is not limited to internal buses and shared memory but has evolved over time to include wireless communication. In this present research, an attempt was made to develop a wireless communication using the embedded technology. At places where communication is not possible in voice this approach can be used as the distant images display on GLCD using just touch screen based transmitter avoiding all sorts of noises.

The main objective of this project was to develop a touch screen graphical Liquid crystal display (GLCD). An attempt was made to design a touch screen GLCD interface with ARM (Advanced RISC machine) LPC2148 processor using the wireless technology, such that when the user touches the touch screen, the required graphical image will be displayed on the screen. The touch screen controller is programmed to read the touch values in real time environment. In the present work, the touch data is encoded and transmitted through the RF (radio frequency) transmitter and decoded at RF receiver on the other



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end and is displayed on GLCD through the ARM processor.

Previously we have GSM mobile which has complex operations to operate. This is very difficult for the handicapped and illiterate persons. In order to overcome this we are using MEMS sensor to find the directions of tilting which is helpful for the user who is interested for fast and less complex operations and also for the illiterates who least prefer for button operations.

Micro-Electro-Mechanical-Systems (MEMS) is the integration of mechanical elements, sensors, actuators and electronics on a common silicon substrate through micro fabrication technology. MEMS are also referred to as micro machines or micro system technology – MST and also called accelerometer. The MEMS accelerometer sensor is the input module of the project and provides the information about the tilt in different directions. The MEMS sensor is also used for balancing the robot in different directions as per the tilt.

In this project we are using MMA7260Q which is 3axis accelerometer. An accelerometer measures acceleration of anything that its mounted on. This MEMS sensor can be extended by using GPS, 3G technologies, VLSI technologies.

OBJECTIVE :

This project aims at designing a GSM mobile with the help of a MEMS sensor to help for a friendly hardware interaction for the user. This kind of hardware interactions are made possible with the help of the MEMS technology. This kind of mobile designs are helpful for user who are interested for a fast and less complex operations and also for the illiterates who least prefer for lot more button operation.

METHODOLOGY:

This project is implemented using following software: Express PCB – for designing circuit. Express PCB is a software tool to design PCBS Specifically for manufacture by the company express PCB (no other PCB maker accepts express PCB files). It is very easy to use but it does have several limitations. PIC C compiler-for compilation part. PIC compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the micro controller for further processing .PIC compiler also support C language code. PROTEUS 7(Embedded C)- for simulation part. PROTEUS is software which accepts only hex files. Once the machine code is converted into hex code, it has to be dumped using PROTEUS. PROTEUS is a programmer which itself contain micro controller in it other than the one which is to be programmed. This microcontroller has a program in it which written in such a way that it accepts the hex file the PIC compiler and dumps this hex file into microcontroller which is to be programmed.

Embedded Systems:

An embedded system is a computer system designed to perform one or a few dedicated functions often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today.

Embedded systems are controlled by one or more main processing cores that are typically either microcontrollers or digital signal processors (DSP). The key characteristic, however, is being dedicated to handle a particular task, which may require very powerful processors. For example, air traffic control systems may usefully be viewed as embedded, even though they involve mainframe computers and dedicated regional and national networks between airports and radar sites. (Each radar probably includes one or more embedded systems of its own.)

In general, "embedded system" is not a strictly definable term, as most systems have some element of extensibility or programmability. For example, handheld computers share some elements with



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embedded systems such as the operating systems and microprocessors which power them, but they allow different applications to be loaded and peripherals to be connected. Moreover, even systems which don't expose programmability as a primary feature generally need to support software updates. On a continuum from "general purpose" to "embedded", large application systems will have subcomponents at most points even if the system as a whole is "designed to perform one or a few dedicated functions", and is thus appropriate to call "embedded". A modern example of embedded system is shown in fig: 2.1.



A modern example of embedded system

Labeled parts include microprocessor (4), RAM (6), flash memory (7).Embedded systems programming is not like normal PC programming. In many ways, programming for an embedded system is like programming PC 15 years ago. The hardware for the system is usually chosen to make the device as cheap

as possible. Spending an extra dollar a unit in order to make things easier to program can cost millions. Hiring a programmer for an extra month is cheap in comparison. This means the programmer must make do with slow processors and low memory, while at the same time battling a need for efficiency not seen in most PC applications. Below is a list of issues specific to the embedded field.

History: In the earliest years of computers in the 1930–40s, computers were sometimes dedicated to a

single task, but were far too large and expensive for most kinds of tasks performed by embedded computers of today. Over time however, the concept of progr ammable controllers evolved from traditional electro mechanical sequencers, via solid state devices, to the use of computer technology. One of the first recognizably modern embedded systems was the Apollo Guidance Computer, developed by Charles Stark Draper at the MIT Instrumentation Laboratory.

Debugging:

Embedded debugging may be performed at different levels, depending on the facilities available. From simplest to most sophisticated they can be roughly grouped into the following areas:

- Interactive resident debugging, using the simple shell provided by the embedded operating system (e.g. Forth and Basic)
- External debugging using logging or serial port output to trace operation using either a monitor in flash or using a debug server like the Remedy Debugger which even works for heterogeneous multi core systems.

Real Time Issues:

Embedded systems frequently control hardware, and must be able to respond to them in real time. Failure to do so could cause inaccuracy in measurements, or even damage hardware such as motors. This is made even more difficult by the lack of resources available. Almost all embedded systems need to be able to prioritize some tasks over others, and to be able to put off/skip low priority tasks such as UI in favor of high

Priority tasks like hardware control.

Need For Embedded Systems:

The uses of embedded systems are virtually limitless, because every day new products are introduced to the market that utilizes embedded computers in novel ways. In recent years, hardware such as microprocessors, microcontrollers, and FPGA chips have become much cheaper. So when implementing a new form of control, it's wiser to just buy the generic chip and write your own custom software for it. Producing a custom-made chip to handle a particular



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task or set of tasks costs far more time and money. Many embedded computers even come with extensive libraries, so that "writing your own software" becomes a very trivial task indeed. From an implementation viewpoint, there is a major difference between a computer and an embedded system. Embedded systems are often required to provide Real-Time response. The main elements that make embedded systems unique are its reliability and ease in debugging.

ARM PROCESSOR REVIEW:

ARM stands for Advanced RISC Machines. It is a 32 bit processor core, used for high end application. It is widely used in Advanced Robotic Applications. It performs number of instruction in a single cycle compare with other controllers it have advanced features. The Arm CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2141/42/44/46/48 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kB up to 40 kB,

make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power.



History and Development:

- ARM was developed at Acron Computers ltd of Cambridge, England between 1983 and 1985.
- RISC concept was introduced in 1980 at Stanford and Berkley.
- ARM ltd was found in 1990.
- ARM cores are licensed to partners so as to develop and fabricate new microcontrollers around same processor cores.

Key features:

- 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory.128-bit wide inter face/accelerator enables high-speed 60 MHz operation.
- In- System Programming/In-Application program ming (ISP/IAP) via on-chip boot loader software. Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1 ms.

Historical Background

The invention of the transistor at Bell Telephone Laboratories in 1947 sparked a fast-growing microelectronic technology. Jack Kilby of Texas Instruments built the first integrated circuit (IC) in 1958 using germanium (Ge) devices. It consisted of one transistor, three resistors, and one capacitor. The IC was implemented on a sliver of Ge that was glued on a glass slide. Later that same year Robert Noyce of Fairchild Semiconductor announced the development of a planar double-diffused Si IC. The complete transition from the original Ge transistors with grown and alloyed junctions to silicon (Si) planar doublediffused devices took about 10 years. The success of Si as an electronic material was due partly to its wide availability from silicon dioxide (SiO2) (sand), resulting in potentially lower material costs relative to other semiconductors.

Related work:



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The use of mobile devices for gathering traffic information is not a new concept; several works indicate the feasibility of an ITS based only on location samples gathered by mobile phones. An early work describes an analytical method for evaluating real-time ITS based on data collected from GPS devices in probe vehicles: a 3-5% of penetration in the traffic flow is enough for adequate traffic estimation. Recent experiments with a system implemented solely on mobile phones show encouraging results for the feasibility and the accuracy of the traffic estimation (compared to that obtained by fixed sensors): a 2-3% penetration of mobile phones running the application in the total car flow suffices for accurate estimation of the average speed. Moreover, commercial navigation applications already integrate location samples from mobile phones in their algorithms for route guidance . However, security and privacy of similar traffic systems remain open challenges and research is conducted in several projects. Successive location updates by a smart phone, even without any identifier, contain spatial and temporal correlation that can be used as indirect identifiers. These can be exploited to reconstruct user paths with tracking techniques . Then traces can be processed and matched in order to infer frequently visited places, e.g., home or workplace, and finally reveal the user identity. To mitigate such threats, several solutions using cloaking techniques or privacy preserving sampling techniques have been proposed. These solutions are complementary to our proposal. In this paper we do not consider this kind of threat against the dataset of location samples. Rather, our goal is to guarantee the anonymity of the location samples and protect the system security. Relevant research in security is conducted for vehicular communication systems .Multiple short-term anonymized certificates, termed pseudonyms, can provide authentication while enhancing location privacy. These certificates are used for a short time and then have to be changed .Group signatures are also proposed, in order to reduce the overhead of pseudonym management. As they are significantly costlier (in terms of communication and computation overhead) than classic public key cryptography,

special care must be taken for the overall secure vehicular communications system design

Group signatures are also used in credentials systems such as Idemix that provide anonymity for authenticated transactions to services. In our proposed architecture we will use group signatures; based on initial implementation results.

POWER SUPPLY

Power supply" is sometimes restricted to those devices that *convert* some other form of energy into electricity (such as solar power and fuel cells and generators). A more accurate term for devices that convert one form of electric power into another form (such as transformers and linear regulators) is power converter. The most common conversion is from AC to DC.

Block Diagram:





LED:

A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting. Introduced as a practical electronic component in 1962, early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet and infrared wavelengths, with very high brightness. The internal structure and parts of a led are shown in figures 3.5.1 and 3.5.2 respectively.





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MEMS sensor MMA 7260 Q:

MEMS sensor MMA7260Q

The MMA7260Q is 3-axis accelerometer .An accelerometer measures acceleration (change in speed) of anything that it's mounted on. Single axis accelerometers measure acceleration in only one direction



Dual-axis accelerometers are the most common measure acceleration in two directions, perpendicular to each other. Three-axis accelerometers measure acceleration in three directions.

Accelerometers are very handy for measuring the orientation of an object relative to the earth, because gravity causes all objects to accelerate towards the earth. A two-axis accelerometer can be used to measure how level an object is.

With a three-axis accelerometer, you can measure an object's acceleration in every direction.

Working of MMA7260Q sensor:

The schematic for the 3-axis accelerometer is shown below. The device can be powered directly through the Vcc/3.3 V pin using a supply that is within the MMA7260QT's acceptable power supply range of 2.2 V to 3.6 V. Alternatively, the board can be powered by higher voltages, up to 16 V, using the VIN pin, which connects to a low-dropout 3.3 V regulator. In this configuration, the Vcc/3.3 V pin can serve as an output to be used as a reference voltage or power source for other low-power devices (up to around 50 mA, depending on the input voltage). The sensitivity selection pins GS1 and GS2 are pulled up to the Vcc line, making the default sensitivity 6g; these pins can be pulled low by a microcontroller or through jumpers. For 5 V microcontroller applications, the lines should not be driven high. Instead, the microcontroller I/O pin can emulate an open-drain or open-collector output by alternating between low output and high-impedance (input) states. Put another way, if you are using a 5 V microcontroller, you should make your sensitivity selection I/O lines inputs and rely upon the internal pull-ups on the GS1 and GS2 lines if you want them to be high. It is always safe for you to drive these lines low.

GLOBAL SYSTEM FOR MOBILE COMMUN ICATIONS (GSM)

Definition of GSM

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in Europe and other parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down 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. It supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service).

SIM900A Overview

Designed for global market, SIM900A is a dual-band GSM/GPRS engine that works on frequencies EGSM900MHz and DCS 1800MHz. SIM900A features GPRS multi-slot class 10/ class 8 (optional) and supports theGPRS coding schemes CS-1, CS-2, CS-3 and CS-4.With a tiny configuration of 24mm x 24mm x 3mm, SIM900A can meet almost all the space



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requirements in your applications, such as M2M, smart phone, PDA and other mobile devices.

The physical interface to the mobile application is a 68-pin SMT pad, which provides all hardware interfaces between the module and customers' boards.

- The keypad and SPI display interface will give you the flexibility to develop customized applications.
- Serial port and Debug port can help you easily develop your applications.
- One audio channel includes a microphone input and a speaker output.
- Programmable General Purpose Input & Output.

The SIM900A is designed with power saving technique so that the current consumption is as low as 1.5mA in SLEEP mode.

The SIM900A is integrated with the TCP/IP protocol; extended TCP/IP AT commands are developed for customers to use the TCP/IP protocol easily, which is very useful for those data transfer applications.

CRYSTAL OSCILLATOR:

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a precise frequency.[1][2][3] This frequency is commonly used to keep track of time, as in quartz wristwatches, to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. The most common type of piezoelectric resonator used is the quartz crystal, so oscillator circuits incorporating them became known as crystal oscillators,[1] but other piezoelectric materials including polycrystalline ceramics are used in similar circuits.

Quartz crystals are manufactured for frequencies from a few tens of kilohertz to hundreds of megahertz. More than two billion crystals are manufactured annually. Most are used for consumer devices such as wristwatches, clocks, radios, computers, and cell phones. Quartz crystals are also found inside test and measurement equipment, such as counters, signal generators, and oscilloscopes.



GSM Modem

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.



GLCD:

GENERAL DESCRIPTIONS:

The PCD8544 is a low power CMOS LCD controller/driver, designed to drive a graphic display of 48 rows and 84 columns. All necessary functions for the display are provided in a single chip, including onchip generation of LCD supply and bias voltages, resulting in a minimum of external components and low power consumption. The PCD8544 interfaces to microcontrollers through a serial bus interface. The PCD8544 is manufactured in n-well CMOS technology.



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2. FEATURES:

- · Single chip LCD controller/driver
- \cdot 48 row, 84 column outputs
- · Display data RAM 48 ´ 84 bits
- · On-chip:

- Generation of LCD supply voltage (external supply also possible)

- Generation of intermediate LCD bias voltages

- Oscillator requires no external components (external clock also possible).

- \cdot External RES (reset) input pin
- · Serial interface maximum 4.0 Mbits/s
- · CMOS compatible inputs
- · Mux rate: 48

 \cdot Logic supply voltage range VDD to VSS: 2.7 to 3.3 V

 \cdot Display supply voltage range VLCD to VSS

- 6.0 to 8.5 V with LCD voltage internally generated (voltage generator enabled)

- 6.0 to 9.0 V with LCD voltage externally supplied (voltage generator switched-off).

• Low power consumption, suitable for battery operated systems

- · Temperature compensation of VLCD
- \cdot Temperature range: -25 to +70 °C.

Timing generator

The timing generator produces the various signals required to drive the internal circuits. Internal chip operation is not affected by operations on the data buses.

Display address counter

The display is generated by continuously shifting rows of RAM data to the dot matrix LCD through the column outputs. The display status (all dots on/off and normal/inverse video) is set by bits E and D in the 'display control' command.

LCD row and column drivers

The PCD8544 contains 48 row and 84 column drivers, which connect the appropriate LCD bias voltages in sequence to the display in accordance with the data to be displayed. Unused outputs should be left unconnected.

PROJECT DESCRIPTION

In this chapter, schematic diagram and interfacing of ARM-7 LPC2148 microcontroller with each module is considered.

The above schematic diagram of construction of MEMS accelerometer sensor based tilt operated touch free mobile phone explains the interfacing section of each component with micro controller MEMS sensor, GSM modem, GLCD, buzzer. The MEMS ACCEL EROMETER SENSOR is the input module of the project and provides the information about the tilt in different directions. While the GSM modem is used for remote communication and it catch holds of a SIM card. it is operated without the need of any control button interface and for this the control makes use of AT commands as per the interest of the user.



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Design and construction of MEMS accelerometer based Touch Free Mobile Phone



RESULT:

The project "Design and construction of MEMS accelerometer sensor based Touch Free Mobile Phone" was designed to help for a friendly hardware interaction for the user. The device is designed by interfacing a Micro Electro Mechanical System (MEMS ACCELEROMETER SENSOR) and a GSM modem.

From the above figure we can seen the cit. with out power supply. The wires connected to the ckt. and GSM has three wires one is interfacing with GSM and MEMS and other one is connected to the serial port.

KEIL U VISION4 SOFTWARE:

The μ Vision IDE from Keil combines project management, make facilities, source code editing, program debugging, and complete simulation in one powerful environment. The μ Vision development platform is easy-to-use and helping you quickly create embedded programs that work. The μ Vision editor and debugger are integrated in a single application that provides a seamless embedded project development environment.

It is possible to create the source files in a text editor such as Notepad, run the Compiler on each C source file, specifying a list of controls, run the Assembler on each Assembler source file, specifying another list of controls, run either the Library Manager or Linker (again specifying a list of controls) and finally running the Object-HEX Converter to convert the Linker output file to an Intel Hex File. Once that has been completed the Hex File can be downloaded to the target hardware and debugged. Alternatively KEIL can be used to create source files; automatically compile, link and covert using options set with an easy to use user interface and finally simulate or perform debugging on the hardware with access to C variables and memory. Unless you have to use the tolls on the command line, the choice is clear. KEIL Greatly simplifies the process of creating and testing an embedded application.

Projects

The user of KEIL centers on "projects". A project is a list of all the source files required to build a single application, all the tool options which specify exactly how to build the application, and – if required – how the application should be simulated. A project contains enough information to take a set of source files and generate exactly the binary code required for the application. Because of the high degree of flexibility required from the tools, there are many options that can be set to configure the tools to operate in a specific manner. It would be tedious to have to set these options up every time the application is being built; therefore they are stored in a project file. Loading the project file into KEIL informs KEIL which source files are required, where they are, and how to configure the tools in the correct way.

KEIL can then execute each tool with the correct options. It is also possible to create new projects in KEIL. Source files are added to the project and the tool options are set as required. The project can then be

saved to preserve the settings. The project is reloaded and the simulator or debugger started, all the desired windows are opened. KEIL project files have the extension

Simulator/Debugger

The simulator/ debugger in KEIL can perform a very detailed simulation of a micro controller along with external signals. It is possible to view the precise



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execution time of a single assembly instruction, or a single line of C code, all the way up to the entire application, simply by entering the crystal frequency. A window can be opened for each peripheral on the device, showing the state of the peripheral. This enables quick trouble shooting of mis-configured peripherals. Breakpoints may be set on either assembly instructions or lines of C code, and execution may be stepped through one instruction or C line at a time. The contents of all the memory areas may be viewed along with ability to find specific variables. In addition the registers may be viewed allowing a detailed view of what the microcontroller is doing at any point in time. The Keil Software 8051 development tools listed below are the programs you use to compile your C code, assemble your assembler source files, link your program together, create HEX files, and debug your target program. µVision2 for Windows[™] Integrated

Development Environment:

Combines Project Management, Source Code Edi ting, and Program Debugging in one powerful environment.

- C51 ANSI Optimizing C Cross Compiler: creates relocatable object modules from your C source code,
- A51 Macro Assembler: creates relocatable object modules from your 8051 assembler source code,
- BL51 Linker/Locator: combines relocatable object modules created by the compiler and assembler into the final absolute object module,
- LIB51 Library Manager: combines object modules into a library, which may be used by the linker,
- OH51 Object-HEX Converter: creates Intel HEX files from absolute object modules.

What's New in µVision3?

 μ Vision3 adds many new features to the Editor like Text Templates, Quick Function Navigation, and Syntax Coloring with brace high lighting Configuration Wizard for dialog based startup and debugger setup. μ Vision3 is fully compatible to μ Vision2 and can be used in parallel with μ Vision2.

CONCLUSION:

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

FUTURE SCOPE:

Our project "Design and construction of MEMS accelerometer sensor based Touch Free Mobile Phone" is mainly intended to provide an interaction with mobile phone using GSM and MEMS accelerometer sensor are helpful for user who is interested for fast and less complex operations and also for the illiterates who least prefers for button operation.

Microcontroller interfaces with MEMS ACCELER OMETER SENSOR based tilt sensor and also with GSM Modem. GSM modem interfacing is done using Serial Communication and AT commands. This system also consists of a 16x2 LCD for better visibility. This displays the control options for tilt based commands, Address book, Mobile operator name and Number dialing/disconnection information.

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