PREVENTION OF ACCIDENT USING THORAX PRESSURE SENSOR

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***Abstract* The project provides a drowsiness detecting apparatus, instantly start drowsiness determination operation and detect drowsiness with high accuracy. Here depth of breathing of a person is detected, and drowsiness of the person is determined when the depth of breathing falls in a predetermined breathing condition including at least one of a sudden decrease in the depth of breathing and a periodic repetion of deep and shallow breathing. The depth of breathing is detected based on the thorax pressure of the person, which is generated by detecting a pulse wave of the person and processing the signal. To use the drowsiness detection for an automobile driver ,the pulse wave is detected by an infrared sensor attached to a steering wheel of the vehicle to be gripped by the driver.**
***Keywords*-thorax pressure, blink rate, sensor, drowsiness, buzzer.**

NEED FOR THE PROJECT

A person has a tendency to get drowsy due to fatigue and/or repetitive nature of the job they do. Some prescription medications also have drowsiness as the main side effect. Drowsy drivers have an impact on safety on the roadways and a wide variety of arrangements for monitoring and alerting drivers who begin to fall asleep or become tired are known. However there are currently no effective devices in the market that alert the driver in a timely manner. Typically when a driver becomes drowsy and becomes to fall asleep their head moves backwards and forwards. Many existing devices concentrate on this behavior to alert the driver. However this is too late. Even a fraction of a second delay in alerting the driver is potentially fatal. The device needs to able to alert the driver before that. Therefore a need exists to provide a drowsy driver alarm system to alert drowsy drivers quickly and effectively.

PROJECT SCOPE

In our project it is possible to detect the drowsiness of an automobile driver with high accuracy. There is no need of specific reference data. Based on the thoracic pressure changes drowsy state of the driver is detected and buzzer buzzes as a notification.

BACKGROUND OF THE PROJECT

Existing System

In existing system we have the facility to detect drowsiness of an automobile driver based on behavior of the driver while driving the vehicle [7]. The analysis of eyelid movements is one of the most promising approaches to predict driver status [2] . Previous approaches to drowsiness detection primarily make pre-assumptions about the relevant behavior, focusing on blink rate, eye closure and yawing [6].

Disadvantages In Existing System

1. In the existing method, the seating pressure largely varies from person to person.
2. If we use biometric information for detection, sampling of the heart rate for setting the reference data require some time.
3. Moreover pre-storing of the reference data requires the identification of the specific driver.

Proposed System

Here drowsiness of the person is determined when the depth of breathing falls in a predetermined breathing condition. The depth of breathing is detected based on thorax pressure, which is generated by detecting pulse wave of the person and processing the signal. We do not use reference data specific to each person.

HARDWARE DESCRIPTION OF THE SYSTEM

Voltage Regulator

Voltage Regulator (regulator), usually having three legs, converts varying input voltage and produces a constant regulated output voltage. The number 78 represents positive voltage and 79 negative one. The 78XX series of voltage regulators are designed for positive input. And the 79XX series is designed for negative input. The LM78XX series typically has the ability to drive current up to 1A for maximum voltage regulation, adding a capacitor in parallel between the common leg and the output is usually recommended.

Crystal oscillator

A crystal oscillator is an electronic circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency Quartz timing crystals are manufactured for frequencies from a few tens of kilohertz to tens of megahertz.

PIC Micro Controller

The PIC micro controller which is being used in this apparatus is PIC 16F917.FIG 2 gives the block diagram of the various components in the controller, The PIC architecture is distinctively minimalist. It characteristic features are:

1. Separate code and data spaces (Harvard architecture)
2. A small number of fixed length instructions.
3. Most instructions are single cycle execution (4 clock cycles), with single delay cycles upon branches and skips.
4. A single accumulator (W), the use of which (as source operand) is implied (ie is not encoded in the opcode).
5. All RAM locations function as registers as source and/or destination of math and other functions.
6. A hardware stack for storing return addresses
7. A fairly small amount of addressable data space (typically 256 bytes), extended through banking.
8. Data space mapped CPU, port, and peripheral registers .
9. The program counter is also mapped into the data space and writable (this is used to implement indirect jumps).

Unlike most other CPUs, there is no distinction between memory space and register space because the RAM serves the job of both memory and registers, and the RAM is usually just referred to as the register file or simply as the registers. This micro controller is used since it has some additional features that make it suitable to be used in many applications.

Data space (RAM)

PICs have a set of registers that function as general purpose RAM. Special purpose control registers for on-chip hardware resources are also mapped into the data space. The addressability of memory varies depending on device series, and all PIC devices have some banking mechanism to extend the addressing to additional memory. Later series of devices feature move instructions which can cover the whole addressable space, independent of the selected bank. In earlier devices (i.e., the baseline and mid-range cores), any register move had to be achieved via the accumulator.
To implement indirect addressing, a "file select register" (FSR) and "indirect register" (INDF) are used: A register number is written to the FSR, after which reads from or writes to INDF will actually be to or from the register pointed to by FSR. Later devices extended this concept with post- and pre- increment/decrement for greater efficiency in accessing sequentially stored data. This also allows FSR to be treated almost like a stack pointer.

Code space

All PICs feature Harvard architecture, so the code space and the data space are separate. PIC code space is generally implemented as EPROM, ROM, or flash ROM. In general, external code memory is not directly addressable due to the lack of an external memory interface. The exceptions are PIC17 and select high pin count PIC18 devices.

Word size

The word size of PICs can be a source of confusion. All PICs handle (and address) data in 8-bit chunks, so they should be called 8-bit microcontrollers. However, the unit of addressability of the code space is not generally the same as the data space. For example, PICs in the baseline and mid-range families have program memory addressable in the same wordsize as the instruction width, ie. 12 or 14 bits respectively. In contrast, in the PIC18 series, the program memory is addressed in 8-bit increments (bytes), which differs from the instruction width of 16 bit.In order to be clear, the program memory capacity is usually stated in number of (single word) instructions, rather than in bytes.

Stacks

PICs have a hardware call stack, which is used to save return addresses. The hardware stack is not software accessible on earlier devices, but this changed with the 18 series devices.Hardware support for a general purpose parameter stack was lacking in early series, but this greatly improved in the 18 series, making the 18 series architecture more friendly to high level language compilers.

Instruction set

A PIC's instructions vary in number from about 35 instructions for the low-end PICs to over 80 instructions for the high-end PICs. The instruction set includes instructions to perform a variety of operations on registers directly, the accumulator and a literal constant or the accumulator and a register, as well as for conditional execution, and program branching. Some operations, such as bit setting and testing, can be performed on any numbered register, but bi-operand arithmetic operations always involve W; writing the result back to either W or the other operand register. To load a constant, it is necessary to load it into W before it can be moved into another register. On the older cores, all register moves needed to pass through W, but this changed on the "high end" cores. The PIC architecture has no (or very meager) hardware support for automatically saving processor state when servicing interrupts. The 18 series improved this situation by implementing shadow registers which save several important registers during an interrupt.

In general, PIC instructions fall into 5 classes:

Operation on W with 8-bit immediate ("literal") operand. E.g. movlw (move literal to W), andlw (AND literal with W). One instruction peculiar to the PIC is retlw, load immediate into W and return, which is used with computed branches to produce lookup tables.

UART

The UART usually does not directly generate or receive the external signals used between different items of equipment. Typically, separate interface devices are used to convert the logic level signals of the UART to and from the external signaling levels.

RS-232

RS-232 (Recommended Standard 232) is a standard for serial binary data signals connecting between a DTE (Data Terminal Equipment) and a DCE (Data Circuit-terminating Equipment). It is commonly used in computer serial ports.

MAX 232

The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.

RELAY

A relay is an electrical switch that opens and closes under the control of another electrical circuit.

CCS PIC-C compiler

The CCS PCW compiler is specially designed to meet the special needs of the PICmicro MCU controllers. These tools allow developers to quickly design application software for these controllers in a highly readable, high-level language.The compilers has some limitations when compared to a more traditional C compiler. The hardware limitations make many traditional C compilers ineffective. As an example of the limitations, the compilers will not permit pointers to constant arrays..

I/O PORTS

This device includes four 8-bit port registers along with their corresponding TRIS registers and one four bit port:

- PORTA and TRISA
- PORTB and TRISB
- PORTC and TRISC
- PORTD and TRISD
- PORTE and TRISE

PORTA, PORTB, PORTC and RE3/MCLR/VPP are implemented on all devices.
PORTD and RE<2:0> are implemented only on the PIC16F914 and PIC16F917.

Interrupt Latency

A very useful and unique property of PICs is that their interrupt latency is constant (it's also low: 3 instruction cycles). The delay is constant even though instructions can take one or two instruction cycles: a dead cycle is optionally inserted into the interrupt response sequence to make this true. External interrupts have to be synchronized with the four clock instruction cycle, otherwise there can be a one instruction cycle jitter. Internal interrupts are already synchronized. The constant interrupt latency allows PICs to achieve interrupt driven low jitter timing

PROJECT DESIGN AND IMPLEMENTATION

Description

Determination unit includes power supply, voltage regulator, Crystal Oscillator, PIC Micro-controller, Interface unit and buzzer.The capacity of the power supply used is 500mA.It regulates the supply to 5mA with the help of voltage regulator and supplies to entire control unit. Crystal oscillator used for triggering both time and pulse signals. Then control moves to PIC micro-controller. It holds the embedded coding for the functions to be performed. With help of interface unit controller communicates with system unit.The system receives the analog pulse signals and converts them into digital thorax signals. The signal waveforms generated is being displayed. According to the time interval and limit for pulse wave detection set by the user it checks for drowsy status. If current rate exceeds the predefined level the buzzer Indication will be made.

Functions

The value calculated is then given to the original pulse rate indication.Based on that signal indication is displayed.

CONCLUSION

This paper presented a system for automatic detection of drowsiness of an automobile driver. Previous approaches focused on assumptions about behaviours that might be predictive of drowsiness. Here, a system for automatically measuring thorax pressure was employed to determine spontaneous behavior during real drowsiness episodes. Thus our project relates to the automatic drowsiness detecting apparatus and method for automatically detecting the drowsiness. It would definitely be a useful one for the vehicle drivers. If this concept is implemented, the occurrence of accidents can be prevented to large extent at any time, especially during nighttime .We can implement this technology using Heart beat and pulse rate also but our project is cost-effective. Since, our product is compact and portable, the user will be more benefited. The drowsiness detection may be applied not only to vehicle drivers but also for students, workers and the like. In near future the system will provide us with safer and more comfortable driving cockpit.

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