

MEASUREMENT OF GAIT
PARAMETERS USING 8051
MICROCONTROLLER

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Introduction

GAIT analysis is the process of quantification and interpretation of human locomotion, which reflects pathologies. In this system, ultrasonic transducers and foot switches are interfaced to check the gait parameters such as cadence and steplength. Cadence is the number of steps taken per minute (steps/minute) and step length is the distance between the point of initial contact of one foot and the point of initial contact of the opposite foot.

The 8051 microcontroller is a popular and widely used microcontroller in embedded systems. It provides a range of features and functionalities that make it suitable for measurement of gait parameters. Its low power consumption, small size, and ease of use make it an ideal choice for implementing measurement of gait parameters using ultrasonic transducers.

By implementing this system, athletes can monitor their performance and they will be able to improve their efficiency. This system has also advantage in medical field.

It's important to note that the specific implementation details may vary based on the exact requirements and available resources. However, this general overview gives you a sense of measurement of gait parameters using ultrasonic transducers and the 8051 Microcontroller can be developed.

Hardware component

- Ultra sonic sensor
- Push switch
- Controller switch

□ 8051 Microcontroller

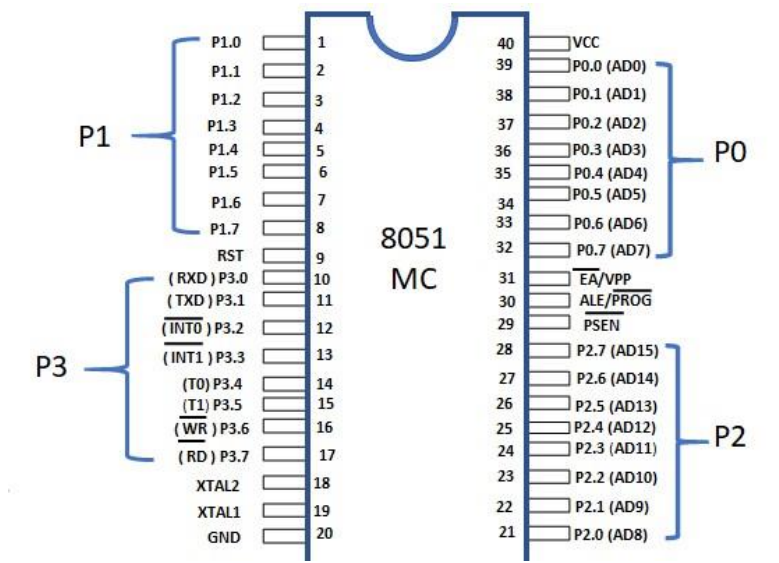
Ultra sonic sensor

An ultrasonic sensor is a device that uses high-frequency sound waves to detect objects and measure distances. It consists of a transmitter and a receiver that work together to emit and receive ultrasonic waves. When the emitted sound waves hit an object, they bounce back and are detected by the receiver. By measuring the time it takes for the sound waves to travel and return, the sensor can calculate the distance to the object. scenarios.



Micro controller

Atmel AT89 series is an intel 8051 compatible family of 8 bit microcontrollers manufactured by the Atmel corporation. AT89C51 is low power, high performance. It has 4 ports and 40 pins. It operates between 2 to 5.5V. It has 4k flash memory with 128 bytes of RAM.



Push switch

A push switch is a type of electrical switch that is activated by applying pressure to its button or actuator. When the button is pressed, it makes a temporary electrical connection, allowing current to flow through the switch and perform a specific function.



Controller switch

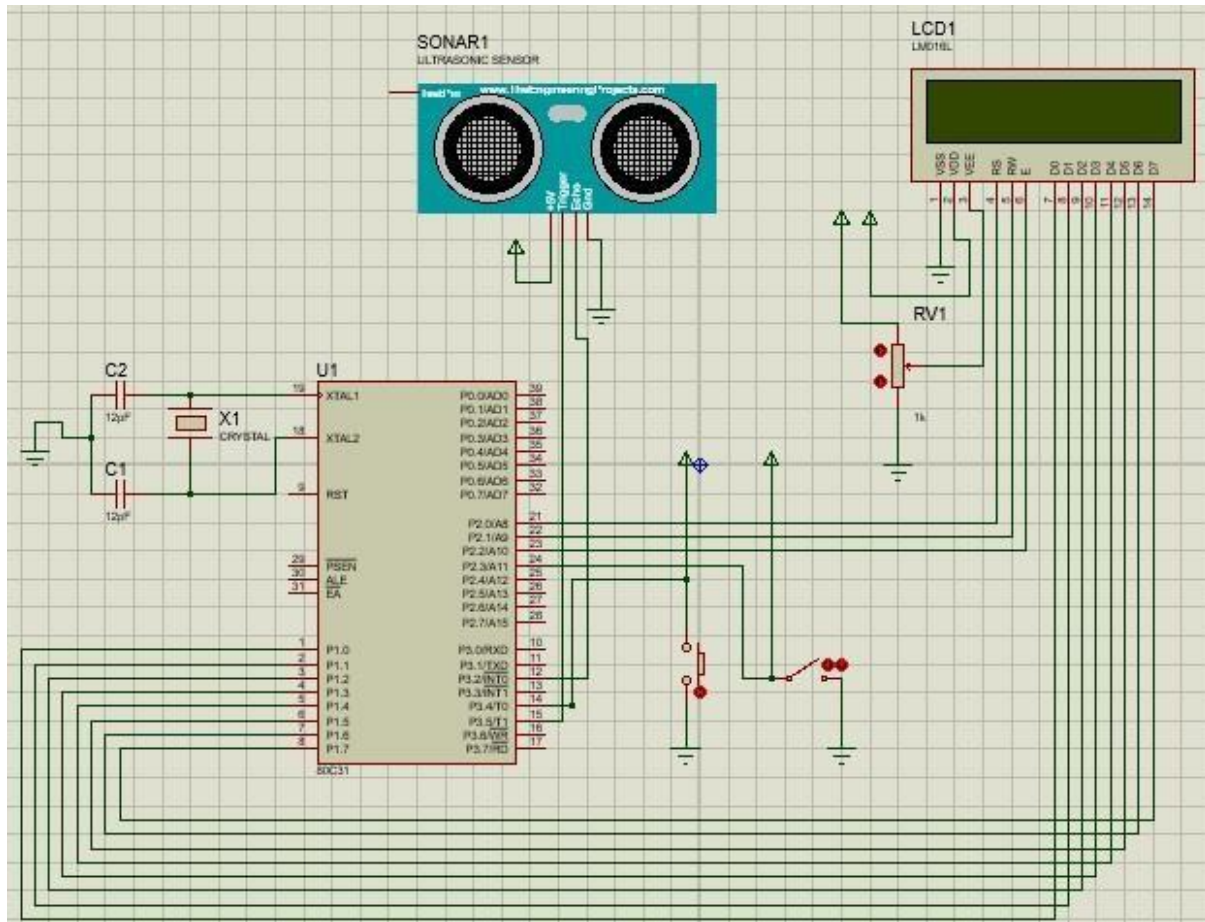
An controller switch is a simple type of switch with two terminals and a single pole that can either be in an ON or OFF position. When the switch is in the ON position, the circuit is closed, allowing the current to flow. Conversely, when the switch is in the OFF position, the circuit is open, interrupting the flow of current.



Software Used

- KEIL Micro Vision
- Proteus

Circuit diagram



Working

In this system, ultrasonic transducers and foot switches are interfaced to the microcontroller for measuring gait parameters using ultrasonic transducers. Foot switches are placed on the heel. A controller switch is used to select the cadence or steplength.

When the controller switch is in off position , the system will measure the step length .Ultrasonic transmitter is placed at the tip of the one foot, and receiver is placed at the heel of the other foot. Ultrasonic waves are

produced from the trigger pin of the sensor and will be received at the echo . This pin is connected to p3.5 .when the echo point become high timer will start counting. So this steplength is calculated from this

When the controller switch is in on position, the system will measure the cadence . The status of the push button will be always monitored by the microcontroller. When the person starts to walk ,the push button will be starts to count. Since only a push button is placed in one shoe, so the total steps will be equal to the ($2 \times$ number of pushes). If N is considered as the total cadence , the precision of the step will be (N-1)or N. This process will continue till one minute.

RESULT

The Gait Parameters (**Cadence** and **steplength**) were measured approximately using the device made with 8051 microcontroller and displayed the output in the LCD display

THE DEVICE

