RES MILITARIS Social Science Journal

# WHEELCHAIR SAFETY ENHANCED: IOT-BASED FALL DETECTION SYSTEM

[#1] KOTICHINTHALA NEETHIKA, Assistant Professor
[#2] SYED SUMERA SANIYA
[#3]SAMALA VINAYKUMAR
Department of Electronics & Communication Engineering
SREE CHAITANYA INSTITUTE OF TECHNOLOGICAL SCIENCES, KARIMNAGAR, TS.

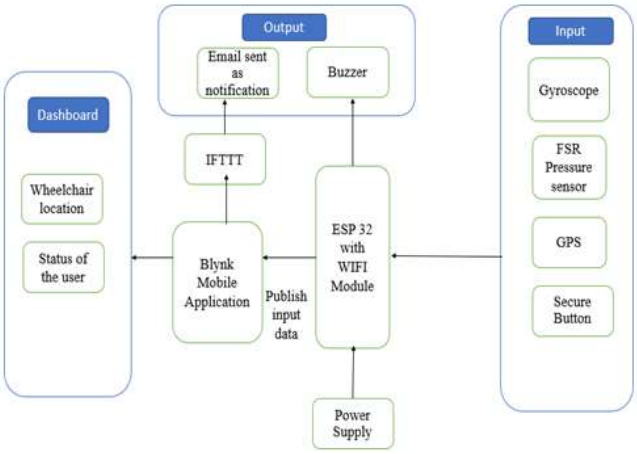
**ABSTRACT:** The importance of wheelchairs for the elderly due to variables such as frailty and medical issues is widely recognized. Our hectic schedule prohibits us from observing them throughout the day. Furthermore, older people run the risk of collapsing from their wheelchair or rising from bed. Should they have fallen while no one was around to witness it? As a result, we can cover the topic of geriatric monitoring in this brief assignment by using RFID (radio frequency identification) and accelerometer sensors. An embedded system with thresholds watches the elderly indoors and out. This paper describes the accelerometer sensor and RFID technology used to monitor the activities of geriatric patients. Using this technology, we may watch the elderly's activity and receive an alarm message on our mobile devices if an accident occurs, allowing us to aid them as soon as possible. Falls can also be used to identify elderly people who live alone, and those with impairments may have mishaps that are unique to them.

***KEYWORDS:*** **Wheelchair, Sensors, Arduino.**

## 1.INTRODUCTION

Clearly, many elderly people use wheelchairs due to medical difficulties. Furthermore, many people's hectic schedules make it difficult to keep track of them constantly. What happens if a senior citizen falls from their wheelchair? Can they raise their voice or seek assistance? Given the regularity of older people unwittingly approaching dangerous circumstances, this occurrence is not unique. As a result, by including gyroscope sensors into this small project, technological techniques can be used to monitor and resolve the issue. This technology allows us to monitor them and maybe detect accidents. The gyroscope sensor can detect falls and immediately tell us via our mobile devices, highlighting the need for assistance and allowing us to respond and prevent additional harm.

## BLOCK DIAGRAM




## 2.COMPONENTS REQUIRED

### Atmega Microcontroller

The Harvard design, on which Atmega microcontrollers are based, includes separate data and program memory. Flash Random Access

Memory (ROM) is also known as program memory or code memory. The memory capacity of programs ranges between 8K and 128K.
Internal static random access memory (SRAM), input/output memory, and 32 general-purpose registers make up the data memory. Internal SRAM and I/O Memory dimensions may vary amongst chips, although General Purpose Registers (GP Registers) remain similar in size.

**Buzzer**

Sound-flapping devices, such as buzzers and beepers, can be mechanical, piezoelectric, or electromechanical. Bells and beepers are commonly used in warning devices, clocks, and to confirm client information, such as in reaction to a cursor click or input.

Fig.3.2 buzzer

Popular ringer scheme enhancements include piezo and attractive components. Many applications use piezo or attractive ringers; however, the choice between the two is based on a variety of criteria. Attractive bells use lower voltages and currents (20 mA) than piezo signals (12-220 V), but piezo ringers have a higher maximum sound pressing factor level (SPL) at 1.5-12 V. Larger impressions are required to get the highest SPL provided by piezo signals. An attractive field is created when a current flows through a wire loop and produces an enticing signal. As current runs through the loop, a ferromagnetic circle that can be modified is drawn to the curl and then returns to its original "rest" position. Sound is generated from an attracting signal by forming a ferromagnetic circle, similar to how a speaker's cone creates sound. Although an appealing bell runs on current, voltage is usually the source of force. The supply voltage and curl impedance regulate current circulation throughout the loop.

**Accelerometer & Gyroscope Sensor**

**Accelerometer:**

Accelerometers are electronic sensors that measure the acceleration or rate of variation in the velocity of an item. In essence, these are devices that respond to vibrations caused by movement.Accelerometers can be designed utilizing a variety of operational principles, including microchip-integrated mems accelerometers. Currently, accelerometers made using MEMS are designed to be readily integrated with microcontrollers like Arduino. The ADXL sensor series (ADXL345, ADXL335) is a noteworthy example of this. Because of their compact sensors, microsaccharide accelerometers are well-suited to low-power applications in the automotive, industrial, and healthcare industries.

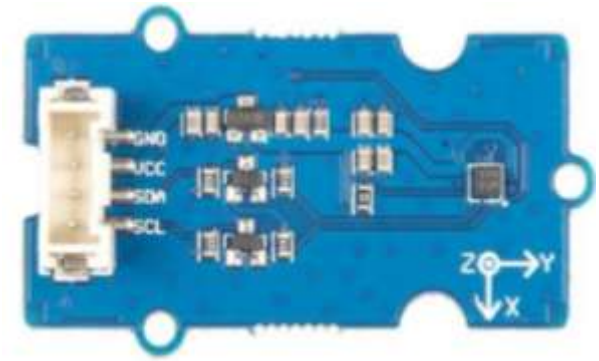



Fig.3.3.1 Accelerometer Sensor

**Gyroscope:**

A traditional gyroscope is made up of a rotor hanging between three gimbal rings.The precision effect is caused by rotation of the spin-axis, which allows gyroscopes to defy gravity. This means that it adjusts laterally automatically rather than tipping over owing to gravity.MEMS (Micro-Electro-Mechanical-System) technology enables the creation of MEMS Gyroscopes, which are small and compact sensors. This allows for the insertion of gyroscope functionality into a more compact enclosure. This technology, which is similar to MEMS accelerometers, allows for lower power consumption, more compatibility with Arduino, Raspberry Pi, and other devices, and lower pricing.

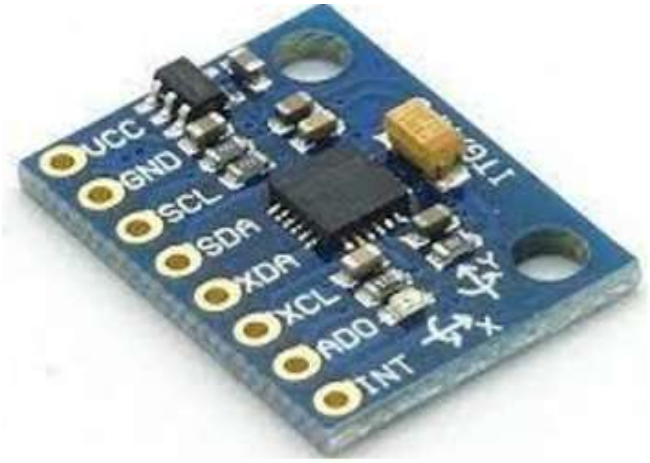



Fig. 3.3.2 Gyroscope sensor

A gyroscope sensor can detect both the velocity and the angular momentum of an object. The use of gyroscope and accelerometer sensors into consumer devices improves the dependability and accuracy of motion detection. There are three distinct ways for measuring angular rate, each depending on the direction. Yaw represents an object's horizontal rotation as seen from above on a level surface. Pitch is a vertical rotation of an item as seen from the front. When an object is viewed from the front, it rotates horizontally. Gyroscope sensors use the Coriolis force principle. To determine the angular rate, an electrical signal is created from the sensor's rotating speed. Observing the operation of the vibration gyroscope sensor might help you understand how it works.

## 3.WORKING PRINCIPLE

We can conclude from the operational principle that the gyroscope sensor can detect a fall. Moving away from the gyroscope sensor or falling from their wheelchair, which is similar to moving away from the sensor, will trigger the alarm. We can deactivate the alarm manually or using our mobile device. The power supply is connected to the microcontroller and sensor via an ATmega connector.

The ATMega then receives the firmware code via the Arduino IDE (Integrated Development Environment). The Gyroscope sensor detects a fall and provides an active low signal, amplifying the sound of the alert. The Arduino IDE's serial monitor displays the value of the sensor. After getting this value, the Adafruit IO server will display the message. Sent!

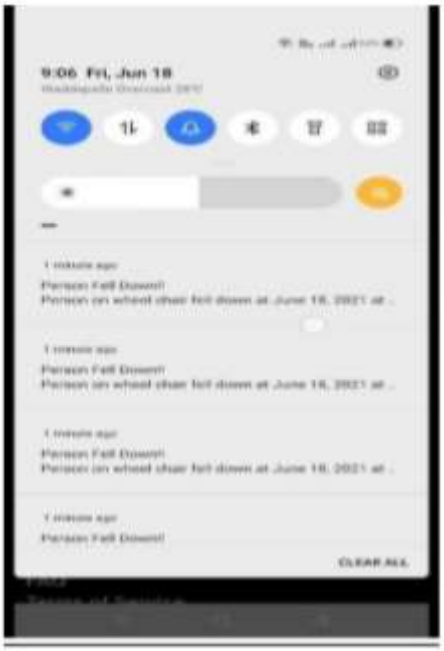


Fig 4.1 image showing notification

We can see that a notification about the folks who fell has been sent to our mobile devices.

## 4.CONCLUSION

The ability to recognize when a septuagenarian requires immediate assistance from another person is critical to the success of this initiative. The goal of this project is to create an Arduino-powered device that serves as a locator for elderly people who have fallen. This method protects the elderly person living alone in their home. In the event of a discrepancy, the system will notify the designated individual via SMS. This allows the entitled individual to continue functioning without concern for the septuagenarian.

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