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Asteroid Impact and Collision Warning System

Surya.R

UG Student, Department of Aerospace Engineering, SRM University, Kattanakalathur, Chennai, India

ABSTRACT: An asteroid is the minor planets which are found in our solar system. Some of the large asteroids can also be encountered which is named as planetoids. Asteroids are different from the comets and meteoroids.

KEYWORDS: Sensors, orbital calculation, SATCOM satellite, Remote Sensing, Ultrasonic sensors, Raspberry Pi entailed arduino.

I. INTRODUCTION

The collision between the astronomical objects causes greater effects on our planet. Impacts have physical occurrences and they tend regularly occur in the planetary systems. Throughout our solar system if the asteroid of the large mass inclines our earth it will cause serious deaths and the injuries to the people. One of the events which had happened was the Tunguska event which pained numerous people.

II. IMPACTS AND THE EARTH

The major impact has significantly shaped the earth history having been the implication in the formation of the earth-moon system. Stony asteroid with a diameter of 4 metres enters the earth atmosphere every year. Asteroids with the larger diameter enter once in the five years and cause the airbursts and the explosion of the craters of the air masses around the world. Some of the asteroids are largely busted on the upper atmosphere itself without having much of the effects on the inner atmosphere of the earth. Thus, the impact of the asteroids is very much powerful than compared to the other collisions and the impacts such as the Hiroshima and the other dreadful events. Most of the solids in the craters become vaporized when the body of the mass is large when compared to the inner atmosphere density.

III. GEOGRAPHICAL SIGNIFICANCE

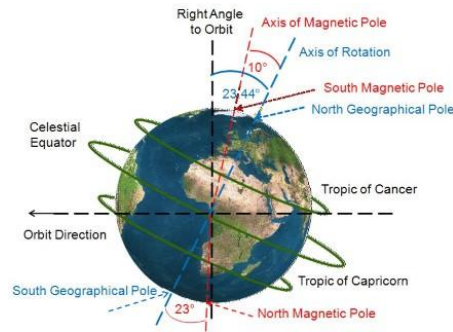
The effect of impact events on the biosphere has been the scientific debate for the longest time. Several theories of the impact-related mass extinctions have been developed, one of the masses which have been affected the earth is the permission-Triassic which ended the Permian period 200 million years ago and has caused the life death of nearly 90 species. It also led to the formation of the dinosaurs which has caused the coincide of the large meteorite and caused the K-T extinction event which occurred 60 million years ago.

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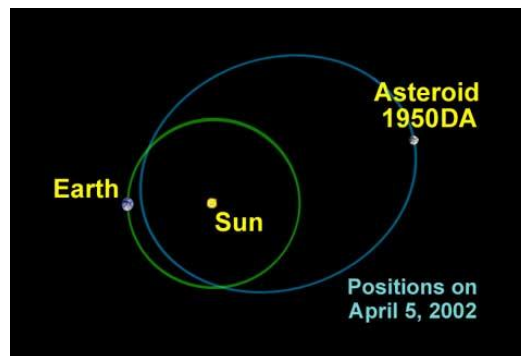
Vol. 8, Issue 10, October 2019



(a). geographical significance of the earth showing the various axis and equatorial poles

IV. ASTEROID IMPACT PREDICTION

In the late 20th and the 21st-century, the scientist has taken measures to measure the near objects and predicting the time and near time which will be involved in striking the earth. The Minor Planet Centre (MPS) in the global is currently working on the prediction of the large object asteroids which is passing over the earth equatorial axis. Currently, there is no such system which is involved in predicting the large objects of the masses of the size 7m asteroid.



(b): RADAR detects the position of the asteroid which is nearing to the orbit of the earth and the sun (from the news release of 2002)

V. SENSORS

In a broadcast definition sensor are the devices which are usually entailed in detecting the changes of the faster rate of the displacement and gives the following output. A good sensor must obey the following
It must send the measured change of the environment to the computer processor.

It is proportional to the measured quantity.

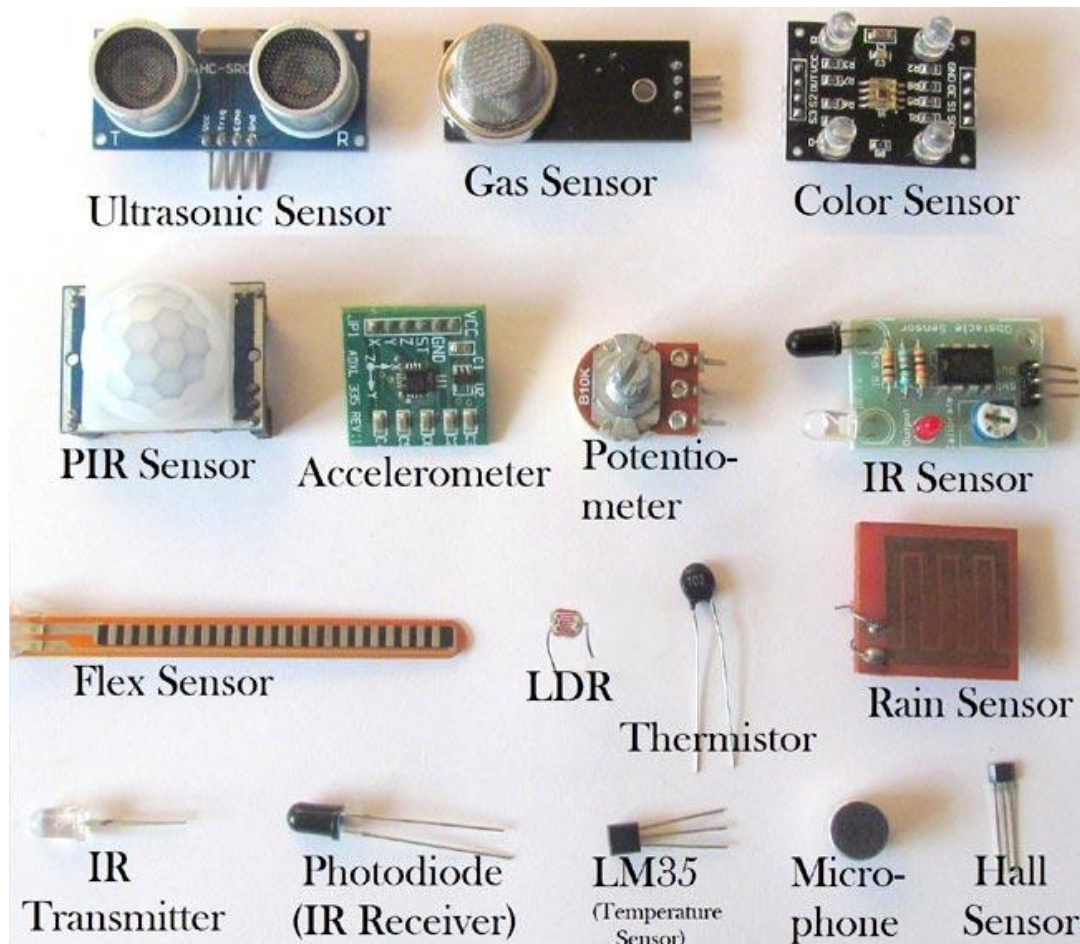
Thus, there are different sensors which can be employed in the various applications and the world for the various measurement equipment's.

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Vol. 8, Issue 10, October 2019



(d): The various sensors which are can be employed with the Arduino and the microelectronic devices.

The relation between distance and voltage from the infrared theory implies

$$1 / (d + k) = a * ADC + b$$

Where

d - the distance in centimetres.

k - corrective constant (using the trial-and-error method)

ADC - the digitalized value of voltage.

a - linear member (value is determined by the trend line equation)

b - free member (value is determined by the trend line equation)

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Vol. 8, Issue 10, October 2019

REMOTE SENSING EMPLOYED IN SPACE APPLICATIONS

Remote sensing is far most widely used sensors on the spacecraft and space-bound objects. They are used because they can be employed in predicting the positional changes rather than being in the local environment

SATELLITE EMPLOYED WITH THE SPACE SENSORS

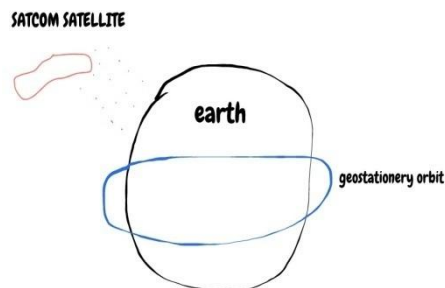
To perform the sensing technology, the satellite is the basic one which helps in ionising the electromagnetic radiations from the earth equatorial earth surface. Some of the communication satellites are used by the space stations for monitoring the surface of the earth.

x, y, z , etc, where x, y, z are the receiver's coordinates, and it is the time correction for the GPS receiver's clock. The four equations are:

where

- c = speed of light (3×10^8 m/s)
- $tt,1, tt,2, tt,3, tt,4$ = times that GPS satellites 1, 2, 3, and 4, respectively, transmitted their signals (these times are provided to the receiver as part of the information that is transmitted).
- $tr,1, tr,2, tr,3, tr,4$ = times that the signals from GPS satellites 1, 2, 3, and 4, respectively, are received (according to the inaccurate GPS receiver's clock)
- $x1, y1, z1$ = coordinates of GPS satellite 1 (these coordinates are provided to the receiver as part of the information that is transmitted); similar meaning for $x2, y2, z2$, etc.

The above formula can be used for the positioning of the geostationary satellite in the earth orbit. With the help of the rocket, the satellite can be guided to the Envisat mission on the following bases.



(e): SATCOM satellite consisting of the two segments such as the Satellite and Terminal segment.

Orbital Speed Equation

Consider a satellite with mass M_{sat} orbiting a central body with a mass of mass $M_{Central}$. The central body could be a planet, the sun or some other large mass capable of causing sufficient acceleration on a less massive nearby object. If

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the satellite moves in circular motion, then the net centripetal force acting upon this orbiting satellite is given by the relationship

$$F_{\text{net}} = (M_{\text{sat}} \cdot v^2) / R$$

This net centripetal force is the result of the gravitational force that attracts the satellite towards the central body and can be represented as

Taking the square root of each side, leaves the following equation for the velocity of a satellite moving about a central body in circular motion

$$v = \sqrt{\frac{G * M_{\text{central}}}{R}}$$

where G is $6.673 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$, M_{central} is the mass of the central body about which the satellite orbits, and R is the radius of orbit for the satellite.

Orbital Period Equation

The final equation that is useful in describing the motion of satellites is Newton's form of Kepler's third law. Since the logic behind the development of the equation has been presented elsewhere, only the equation will be presented here. The period of a satellite (T) and the mean distance from the central body R are related by the following equation:

$$\frac{T^2}{R^3} = \frac{4 * \pi^2}{G * M_{\text{central}}}$$

where T is the period of the satellite, R is the average radius of orbit for the satellite (distance from center of central planet), and G is $6.673 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$.

There is an important concept evident in all three of these equations – the period, speed and the acceleration of an orbiting satellite are not dependent upon the mass of the satellite.

$$v = \sqrt{\frac{G * M_{\text{central}}}{R}} \quad a = \frac{G * M_{\text{central}}}{R^2} \quad \frac{T^2}{R^3} = \frac{4 * \pi^2}{G * M_{\text{central}}}$$

None of these three equations has the variable $M_{\text{satellite}}$ in them. The period, speed and acceleration of a satellite are only dependent upon the radius of orbit and the mass of the central body that the satellite is orbiting. Just as in the case of the motion of projectiles on earth, the mass of the projectile has no effect upon the acceleration towards the earth and the speed at any instant. When air resistance is negligible and only gravity is present, the mass of the moving object becomes a non-factor. Such is the case of orbiting satellites.

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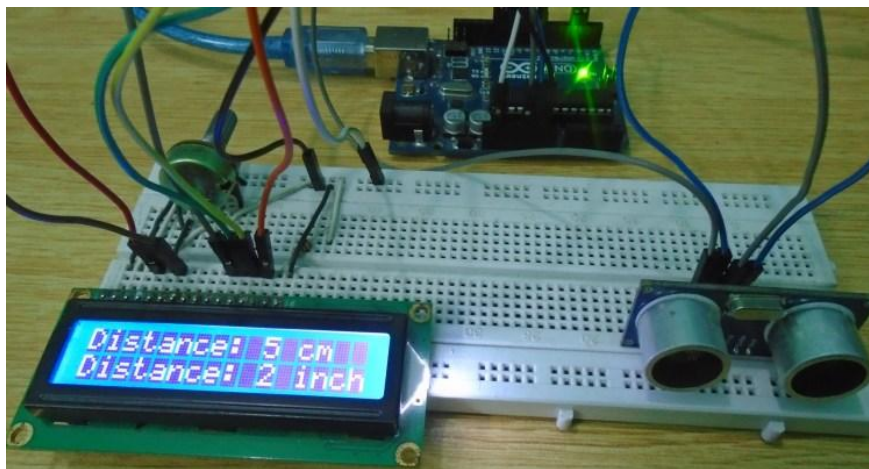
VI. ULTRASONIC SENSORS

Ultrasonic sensors are a type of acoustic sensor divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound.

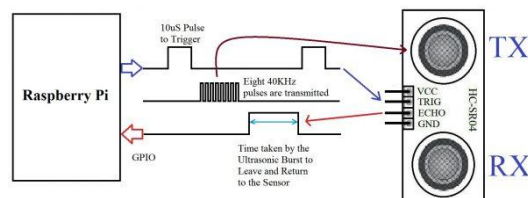
ULTRASONIC EMBEDDED WITH TACTILE SENSORS

Ultrasonic transducers convert AC into ultrasound, as well as the reverse. Ultrasonic, typically refers to piezoelectric transducers or capacitive transducers. Piezoelectric crystals change size and shape when a voltage is applied; AC voltage makes them oscillate at the same frequency and produce ultrasonic sound. Capacitive transducers use electrostatic fields between a conductive diaphragm and a backing plate.

The beam pattern of a transducer can be determined by the active transducer area and shape, the ultrasound wavelength, and the sound velocity of the propagation medium. The diagrams show the sound fields of an unfocused and a focusing ultrasonic transducer in water, plainly at differing energy levels.



(f): Ultrasonic sensor entailed with the Raspberry PI count electron showing the distance of the object.



(g): Block diagram of the Raspberry PI with the receiving and transmitting units.

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VII. RESULTS AND DISCUSSIONS

With the help of the advance technology it is possible to prevent the adventure of the asteroid and meteorites and to protect the future charming people. Thus, the above ultrasonic sensors and the transducers produced the desired result with the accurate range and sensibility.

VIII. CONCLUSION

Asteroid hit is a melancholy loss for the world people and also for the motherland. It is not possible to predict about the exact location of the earth equatorial plane with respect to the electromagnetic spectrum.

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