Solar Powered Smart Bottle

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Abstract: In this project, by taking Solar Energy into consideration. We have prepared a water bottle fixed with a flexible solar panel to charge our daily drivers that is phones and tablets. The material used in making the bottle is also derived from nature that is Bamboo. In the aim to reduce or eliminate plastic waste. It considers the use of eco-friendly biodegradable material so as to bring an alternative for the use and throw or plastic water bottles in general. The bottle is also equipped with a 5W bluetooth speaker with a mic. This can be used for entertainment purpose during camping, treks or any adventure sport. It can also be used for attending calls through bottle itself, rather than taking ua phone out from the pocket. Thus the smart bottle is designed to achieve a multi purpose usage of a bottle which is environmental friendly in nature and with lots of health benefits.

1 INTRODUCTION

As solar energy became more affordable over the previous decade, more and more environmentally-friendly products, like solar shades and blinds, have flooded the market. Solar water bottles are one such example of innovation in this sector, with applications in hiking, camping, and other off-grid situations.

This is a power-packed water bottle that incorporates the use of precision engineering and high-tech features for an improved experience. Grabbing a water bottle has never been more exciting than it is now. This is a "tech" bottle that does it all and does it well. This bottle is equipped with rechargeable 5W Bluetooth speaker for a wide-ranging auditory solution. It's a wonderful addition to the daily commute as one can quickly connect via Bluetooth and stream music in a matter of seconds. This can become a problem without the right solution in hand. For Solar Powered Smart Water Bottle Users, charging a phone is never a problem.

The bottle comes fitted with a power bank that's easy to use, engaging, and incredibly powerful all wrapped into one. All it takes is the use of this power bank and the accompanying USB output for the device to be charged. For anyone that needs a bit of power while on the move, the Solar Powered Smart Water Bottle has a ready-made solution. This bottle provides a robust option with the inclusion of a well-positioned microphone. With a simple press of a button, the phone call will come on and you will be able to communicate with the other person. This is a brilliant solution that makes taking calls a breeze. With a 600ml capacity, this is a well-sized water bottle with ample room for water, juice, or whatever else your taste buds enjoy. It comes with a safety feature as well, as it consists of a panic button which is directly connected with a GPS and a SIM Module. When the person during any emergency condition, just by pressing a button the location of the person will be sent to his family members.

2 LITERATURES

The rapid growth of Internet of Things (IoT) and miniature wearable biosensors have generated new opportunities for personalized eHealth and mHealth services. Smart objects equipped with physiological sensors can provide robust monitoring of activities of daily living and context for wearable physiological sensors. We present a case study of an intelligent water bottle that can precisely measure the amount of liquid in the bottle, monitor activity using inertial sensors, and physiological parameters using a touch and photoplethysmographic sensor. We evaluate two system configurations: a smart water bottle integrated into a personal body sensor network and a cloud based device. This paper presents system organization and the results from preliminary field testing of the prototype device.

In this omnipresent IT world even the non-living items communicate amongst themselves and smartly react depending on dynamic situations. IOT (Internet of Things) is a technology which is highly emerging that understands and conceptualizes this nature of computing. The paper gives a brief review on water bottle using IOT technology. Water is very important part of human life. Variety of parameters effect the quality of water. The smart bottle monitors these parameters constantly in real time using input sensors, the system then processes the input data and performs necessary actions if required using actuators. This system will be helpful for health conscious human beings in today's life. This system can also be greatly utilized in healthcare domain where extra care needs to be taken in all aspects.

Water intake is important for health as it helps build the resilience of respiratory organs, especially among elderly people. However, elderly individuals are unaware of appropriate ways to consume water including adequate intake, timings, frequency, etc. This study attempted to identify the

potential for consuming water, existing problems, types of consumers, and water intake behavior fornewseniors. Survey and in-depth interview data were collected, and a "persona" was used to understand new seniors' goal and needs. The results showed that they struggled to adhere to habitual water consumption. Further, a smart water bottle that guides users to consistently drink appropriate amounts of water was addressed by applying the Internet of Things (IoT) technology to health care services.

3 METHODOLOGY

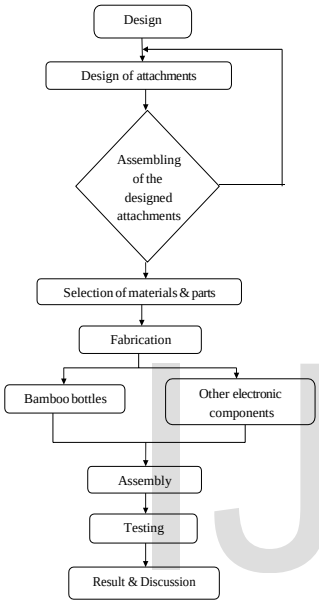

Fig 1

4.1 Design:

Taking the consideration of all the attachments and the purpose, the model of the bottle was designed and assembled in Catia V5.

4.2 Design of attachments:

There are two attachments for the bottle, first attachment consist of power bank with a GPS module, for tracking and the second attachment consists of a Bluetooth speaker with a mic.

4.3 Assembling of the designed attachments:

The designed attachments are assembled to the bottle at the bottom surface by screw type mechanism.

4.4 Fabrication:

The bamboo bottle is fabricated according to the requirement, as there are attachments to be fixed to the bottle. And also the attachment consists of all the electrical components inside.

4.5 Assembly:

Once the fabrication of each component is finished. The each components including electrical circuits should be assembled inside each attachment. And later on each attachment should be fixed to the bottle.

4.6 Testing:

Testing should be carried out with respect to each and every electrical components, so that there won't be any faulty electricals and programing.

4.7 Results and Discussion:

By following all the above steps, the physical working model of the bottle is analyzed.

4 PARTS OF SMART WATER BOTTLE

Fig 2: Solar powered smart bottle

The position of different components is as shown in fig. The equipment's are listed below.

4.1. Solar panel

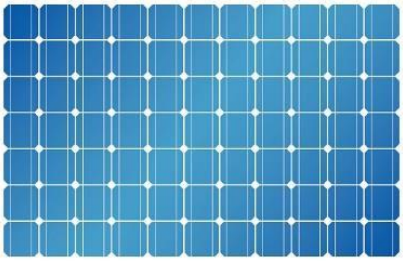

Fig 3: Solar panel

A standard solar panel (also known as a solar module) consists of a layer of silicon cells, a metal frame, a glass casing, and various wiring to allow current to flow from the silicon cells. Silicon (atomic #14 on the periodic table) is a nonmetal with conductive properties that allow it to absorb and convert sunlight into electricity. When light interacts with a silicon cell, it causes electrons to be set into motion, which initiates a flow of electric current. This is known as the “photovoltaic effect,” and it describes the general functionality of solar panel Solar panels work by absorbing sunlight with photovoltaic cells, generating direct current (DC) energy and then converting it to usable alternating current (AC) energy with the help of inverter technology.

4.2. Lithium Polymer Battery

Fig 4: Lithium polymer battery

A lithium polymer battery, or more correctly lithium-ion polymer battery (abbreviated as LiPo, LIP, Li-poly, lithium-poly and others), is a rechargeable battery of lithium-ion technology using a polymer electrolyte instead of a liquid electrolyte. High conductivity semisolid (gel) polymers form this electrolyte. These batteries provide higher specific energy than other lithium battery types and are used in applications where weight is a critical feature, like mobile devices and radio-controlled aircraft.

A typical cell has four main components: positive electrode, negative electrode, separator and electrolyte. The separator itself may be a polymer, such as a microporous film of polyethylene (PE) or polypropylene (PP); thus, even when the cell has a liquid electrolyte, it will still contain a "polymer" component. In addition to this, the positive electrode can be further divided into three parts: the lithium-transition-metal-oxide (such as $LiCoO_2$ or $LiMn_2O_4$), a conductive additive, and a polymer binder of poly (vinylidene fluoride) (PVdF).

4.3. Speaker

Fig 5: Speaker

A loudspeaker (or loud-speaker or speaker) is an electroacoustic transducer; a device which converts an electrical audio signal into a corresponding sound. The most widely used type of speaker in the 2010s is the dynamic speaker, invented in 1924 by Edward W. Kellogg and Chester W. Rice. The dynamic speaker operates on the same basic principle as a dynamic microphone, but in reverse, to produce sound from an electrical signal. When an alternating current electrical audio signal is applied to its voice coil, a coil of wire suspended in a circular gap between the poles of a permanent magnet, the coil is forced to move rapidly back and forth due to Faraday's law of induction, which causes a diaphragm (usually conically shaped) attached to the coil to move back and forth, pushing on the air to create sound waves. Besides this most common method, there are several alternative technologies that can be used to convert an electrical signal into sound. The sound source (e.g., a sound recording or a microphone) must be amplified or strengthened with an audio power amplifier before the signal is sent to the speaker.

4.4. Bluetooth

Fig 6: Bluetooth

Bluetooth is a wireless technology standard used for exchanging data between fixed and mobile devices over short distances using short-wavelength UHF radio waves in the industrial, scientific and medical radio bands, from 2.400 to 2.485 GHz, and building personal area networks (PANs). It was originally conceived as a wireless alternative to RS-232 data cables. A master BR/EDR Bluetooth device can communicate with a maximum of seven devices in a piconet (an ad-hoc computer network using Bluetooth technology), though not all devices reach this maximum. The devices can switch roles, by agreement, and the slave can become the master (for example, a headset initiating a connection to a phone necessarily begins as master as an initiator of the connection but may subsequently operate as the slave).

4.5. Microphone

Fig 7: Microphone

A microphone, colloquially named mic or mike is a device a transducer that converts sound into an electrical signal. Microphones are used in many applications such as telephones, hearing aids, public address systems for concert halls and public events, motion picture production, live and recorded audio engineering, sound recording, two-way radios, megaphones, radio and television broadcasting, and in computers for recording voice.
RF condenser microphones use a comparatively low RF voltage, generated by a low-noise oscillator. The signal from the oscillator may either be amplitude modulated by the capacitance changes produced by the sound waves moving the capsule diaphragm, or the capsule may be part of a resonant circuit that modulates the frequency of the oscillator signal. Demodulation yields a low-noise audio frequency signal with a very low source impedance. The absence of a high bias voltage permits the use of a diaphragm with looser tension, which may be used to achieve wider frequency response due to higher compliance.

4.6. GPS module with SIM:

Fig 8: GPS module with SIM

GPS is a space-based satellite navigation system. It provides location and time information in all weather conditions, anywhere on or near the Earth. GPS receivers are popularly used for navigation, positioning, time dissemination and other research purposes. The GPS consists of satellites that orbit the earth. These satellites are geosynchronous with an orbital period that is the same as the Earth's rotation period. So they maintain exactly the same position with respect to the earth below them. All the GPS satellites transmit radio signals, which are then captured by a GPS receiver and used to calculate its geographical position. A minimum of four satellites may be required to compute the four dimensions of X, Y, Z (latitude, longitude and elevation) and time. GPS receiver converts the received signals into position and estimates time and some other useful information depending on the application and requirements.
It features ultra-low power consumption in sleep mode and integrated with charging circuit for Li-Ion batteries, that make it get a super long standby time and convenient for projects that use rechargeable Li-Ion battery.

4.7. Compass

Fig 9: Compass

A compass is an instrument used for navigation and orientation that shows direction relative to the geographic cardinal directions (or points). Usually, a diagram called a compass rose shows the directions north, south, east, and west on the compass face as abbreviated initials. When the compass is used, the rose can be aligned with the corresponding geographic directions; for example, the "N" mark on the rose points northward. Compasses often display markings for angles in degrees in addition to (or sometimes instead of) the rose. North corresponds to 0°, and the angles increase clockwise, so east is 90° degrees, south is 180°, and west is 270°. These numbers allow the compass to show magnetic North azimuths or true North azimuths or bearings, which are commonly stated in this notation. If magnetic declination between the magnetic North and true North at latitude angle and longitude angle is known, then direction of magnetic North also gives direction of true North.

4.8. Bamboo bottle

Fig 10: Bamboo bottle

Bamboos are a group of woody perennial evergreen plants in the true grass family Poaceae. Bamboos are of notable economic and cultural significance in South Asia, Southeast Asia and East Asia, being used for building materials, as a food source, and as a versatile raw product. Bamboo, like wood, is a natural composite material with a high strength-to-weight ratio useful for structures. Bamboo's strength-to-weight ratio is similar to timber, and its strength is generally similar to a strong softwood or hardwood timber. Drinking water in a bamboo bottle provides the body with nutrients found in it such as vitamin B6 (pyridoxine), potassium,

copper, manganese, zinc, vitamin B2 (riboflavin), tryptophan, protein, isoleucine and iron. Bamboo has been associated with purity for centuries. There is no possibility of any infection by drinking water in bamboo bottle. By drinking water in bamboo bottle, one can look young for a long time. This is because bamboo is found in plenty of antioxidants. These elements give our skin a youthful look and slow down the process of destruction of cells. If the water kept in the bamboo bottle is used for washing the face, it makes the face beautiful.

5 CONCLUSION

Proposed arrangement used for solar powered smart bottle has a lot of potential applications especially in adventure sports, camping and treks. Where use of renewable resources and biodegradable material is receiving ample attention.

Its is a modern day technology with Maximum utilization of renewable energy for charging the devices. And the bottle used is made up of bamboo, it helps in Reduction of plastic wastage in the environment. The bamboo is naturally anti-bacterial and anti-fungal in nature hence reduction in spread of dreadful diseases. As the bottle is equipped with a panic button. This added safety features helps during any emergency condition.

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