INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 4, Issue 3)
Available online at: www.ijariit.com

Home security using piezoelectric sensor

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ABSTRACT

Presently days, mechanization assumes a pivotal part in all workplaces and living homes. By and by mechanization systems are executed either utilizing microcontroller or PC. Microcontroller can't run different projects at once. With the utilization of Microcontroller, it is hard to control both the machines and reconnaissance at once i.e., it is exceptionally mind-boggling to play out the numerous capacities all the while. We can accomplish this with the PC, however utilizing the PC is exceptionally costly for this reason and expends more power. The Raspberry Pi is a solitary board PC and it can be utilized to conquer these issues. Basically, the Raspberry Pi framework capacities like a PC with little setup. It contains GPIO and USB ports. Utilizing these ports we can control the machines with the sensors and also interface the camera for reconnaissance. Raspberry Pi can be utilized for various purposes in view of our necessity. Security is the principle point utilizing piezoelectric sensor where this sensor is a minimal effort one. Where Piezoelectric Effect is the capacity of specific materials to create an electric charge in light of connected mechanical pressure. Alternate systems utilize diverse sorts of sensors to secure home.

Keywords: *Raspberry Pi, Piezoelectric sensor, Home automation, Security, Sensors*

1. INTRODUCTION

Home security is both the security equipment set up on a property and also individual security rehearses. Security equipment incorporates entryways, locks, caution frameworks, lighting, movement identifiers, surveillance camera frameworks, and so on that are introduced on a property; individual security includes practices, for example, guaranteeing entryways are bolted, alerts enacted, windows shut, additional keys not covered up outside, and so forth. Home computerization is received for reasons of straightforwardness, security and vitality productivity. This venture contends that home robotization can have any kind of effect in regards to better vitality administration and utilization of sustainable power sources. Individuals are more sensible to the need of utilizing vitality and different assets all the more soundly yet do next to no to that end on their day by day inhabits home. A family unit security framework incorporated with a home mechanization framework can give extra administrations, for example, remote observation of surveillance cameras over the Internet, or focal locking of all border entryways and windows. Hole identification, smoke, and CO indicators, Indoor situating frameworks, Home mechanization for the elderly and debilitated, Pet Care, for instance following the pets developments and controlling access rights, Air quality control. For instance, Air Quality Egg is utilized by individuals at home to screen the air quality and contamination level in the city and make a contamination map. We are living in the realm of computerization where the greater part of the frameworks are getting mechanized, for example, modern mechanization, homes and different business areas. Home computerization frameworks are headway to the automation forms wherein human endeavors are required with the apparatus supplies to work different loads in homes. It includes programmed controlling of home machines utilizing distinctive advances and controllers over work areas, workstations PDAs or tablets.

Home mechanization framework makes the tasks of different home apparatuses more helpful and spares vitality. With the vitality sparing idea, home robotization or building mechanization makes life extremely straightforward these days. It includes programmed controlling of all electrical or electronic gadgets in homes or even remotely through remote correspondence. Brought together control of lighting types of gear, aerating and cooling and warming, sound/video frameworks, security frameworks, kitchen machines and

every other hardware utilized as a part of home frameworks is conceivable with this framework.

This framework is for the most part actualized by sensors, controlling gadgets and actuators as appeared in the figure. The sensors recognize light, movement, temperature and other detecting components, and after that send that information to the fundamental controlling gadgets. These sensors can be thermocouples or thermistors, photograph identifiers, level sensors, weight sensors, current transformers, IR sensors, and so on, which require an extra flag molding gear to speak with the principle controller.

Controllers might be PCs/PCs, contact cushions, advanced mobile phones, and so forth, joined to the controlling gadgets like programmable-rationale controllers that get the data from the sensors, and in light of the program, control the actuators. This program can be adjusted in light of the heap activities. The programmable controller permits to interface different sensors and actuators through different information and yield modules whether they are simple or advanced.

Actuators are the last controlling gadgets like breaking point switches, transfers, engines and other controlling systems which at long last control the home types of gear. Correspondence assumes a vital part in this home computerization framework for the remote access of these tasks. This savvy home framework additionally furnishes persistent checking through video observation with cameras, booking, and vitality sparing activities. This is the best arrangement notwithstanding for the elderly and the debilitated people to work supplies.

2. RELATED WORK AND BACKGROUND INFORMATION

N. Sri s kanthan and Tan Karand in their work have displayed a utilization of Bluetooth Technology for Home Automation. The Bluetooth innovation which developed in late 1990's is utilized for executing the remote home robotization framework. Different machines, for example, aeration and cooling systems, home theaters, mobile phones and so forth. Are interconnected, along these lines making a Personal Area Network in Home Environment. The correspondence between a few customer modules and the host server happens through the Bluetooth module. A Home Automation Protocol has been produced to improve the correspondence between the host server and the customer modules. The framework additionally enables incorporation or expulsion of gadgets to the system which makes the framework versatile. The remote framework goes for diminishing the cost of Home Automation. In any case, the framework does not utilize the drifting versatile innovation.

A. Z. Alkar and U. Buhur have built up a web-based remote home mechanization framework for multifunctional gadgets. An adaptable, minimal effort, remote answer for the home computerization is presented. The change of the underlying basic usefulness control instrument of gadgets to more unpredictable gadgets has been talked about. The home machines are associated through a server to a focal hub. The framework is secured from unapproved clients by utilizing SSL calculation. Amid tests, the remote correspondence was observed to be constrained to <100 meters in a solid building. Muhammad IzharRamli, MohdHelmyAbdWahab, Nabihah built up a model electrical gadget control framework utilizing Web. They have built up an electronic controller, for controlling electrical gadgets. At whatever point the state of the server is down they additionally set their server with auto restart. The framework does not utilize versatile innovation. Being an online framework; this application is less powerful since the utilization of earphones and Smart telephones are expanding quickly.

E. Yavuz, B. Hasan, I. Serkan and K. Duygu have composed and executed a phone and PIC remote-controlled gadget for controlling the home electrical gadgets. In this Pin check calculation has been presented where it was with link arrange and not remote correspondence. The framework guarantees wellbeing as it can't be utilized by unapproved clients as the framework utilizes Pin-check framework. The engineering is extremely unpredictable, yet it gives a thought of remote treatment of home robotization framework.

Shahriyar, E. Hoque, M. M. Akbar, S. Sohan, I. Naim, and M. K. Khan exhibited a GSM-based correspondence and control for home apparatuses. Diverse AT summons is sent to the Home Mobile for controlling distinctive machines. The disadvantage of this framework is that a Graphical User Interface (GUI) isn't given to the client. Distinctive AT orders must be recalled by the clients to control the associated gadgets. Likewise, the framework underpins Java empowered cell phones. The framework along these lines turns out to be less utilitarian as nowadays the utilization of Java empowers telephones are decreasing and the utilization of Android telephones are expanding massively.

JitendraRajendraRana and Sunil N.Pawar in their paper have executed a ZigBee based home computerization framework. Zigbee is an abnormal state correspondence convention used to make individual zone organize. It underpins any sort of microcontroller. The framework wipes out the intricacy of wiring in the event of wired mechanization. A significant measure of energy sparing is additionally conceivable. Working extent is more than Bluetooth. In any case, the framework does not permit remote observing and controlling of machines.

3. MATERIALS AND METHODS

This segment displays the proposed framework engineering, the product and equipment modules expected to actualize and convey the unavoidable observing foundation and furthermore exhibits the execution of an underlying model that demonstrates the usefulness of the framework.

Proposed system architecture

The diagram for proposed system is given in figure 1.

Components of the proposed system

RASPBERRY PI:

Raspberry Pi is a little PC with the measurements; 85.60 mm 53.98 mm 17 mm, weighing just 45g and reasonable for 25–35$. This makes it ideal for home robotization, where a little gadget can without much of a stretch be set for a situation and mounted on a divider. The Raspberry Pi board contains a processor and designs chip, a program memory (RAM – Random-Access Memory) and different interfaces and connectors for outer gadgets. A portion of these gadgets are fundamental, others are discretionary, yet all Raspberry Pi models have a similar processor, a framework on a chip (SoC) named BCM28351. It is shabby, effective, and it doesn't devour a considerable measure of energy [8]. The unit of

Raspberry Pi can be fueled utilizing a scope of energy sources (accepting they can give enough current 700 mA)

Fig. 1: System architecture (Camera, Gas detector, wifi Adapter will add for the future scope)

Fig. 2: Raspberry Pi board

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- Computer USB (Universal Serial Bus) Port or controlled USB center point (will rely upon control yield).
- Special divider warts with USB ports,
- Mobile Phone Backup Battery (will rely upon control yield),
- The Raspberry Pi can be additionally controlled from soluble batteries. The most appropriate pack, which satisfies the moderately high power necessity, is made of six rechargeable AA batteries and a voltage controller

The Raspberry Pi has four particular power modes:

- The run mode – the focal handling unit (CPU) and all usefulness of the ARM11 center are accessible and controlled up.
- The standby mode – the principle center timekeepers are closed down (the parts of the CPU that procedure directions are never again running) despite the fact that the power circuits on the center are as yet dynamic this mode is otherwise called "Wait for Interrupt" (WFI) mode, the center can be immediately woken up by a procedure creating a unique call to the CPU called an intrude. This hinder will stop any present preparing and do what the calling procedure has requested.
- The shutdown mode – there is no power.
- The lethargic mode – the center is shut down and all stores are left fueled on.

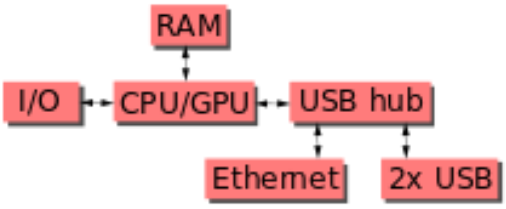

Fig. 3: Hardware Structure of raspberry pi

Raspberry Pi works as a standard (PC), requiring a console for charge passage, a show unit, and a power supply, and as a Web Server, when peripherals (console and show) are not required. At the end of the day, Raspberry Pi fits impeccably as a server gadget which is working with an entire system of a single reason for existing customers' gadgets.

Secure Digital (SD) streak memory card is arranged such that it reflects a hard drive to Raspberry Pi's processor. Although extensive SD cards holding 32 GB, 64 GB or more are accessible, they are frequently restrictively costly, yet the base required the size of an SD card is 2 GB relying upon the circulation requests of the working framework. On the off chance that conceivable, the SD card class 10 ought to be utilized. The capacity can be extended, by utilizing gadgets that give an extra hard drive after utilizing the USB ports. It is likewise vital to take note of that the Raspberry Pi Models B and B+ have 512 MB. Internet availability might be by means of an Ethernet/LAN link. Demonstrate B has a standard RJ45 Ethernet port. The Raspberry Pi Model B Ethernet port is auto-detecting which implies that it might be associated with a switch or straightforwardly to another PC (without the need fora hybrid link). Wi-Fi network through a USB dongle is an elective choice [13]. Utilizing such a gadget, the Raspberry Pi can be utilized for making specially appointed systems or to interface with an extensive variety of remote systems, including those running on the most recent 802.11n fast standard.

Piezo electric sensor:

Piezoelectric Effect is the ability of certain materials to generate an electric charge in response to applied mechanical stress. The word Piezoelectric is derived from the Greek piezein, which means to squeeze or press, and piezo, which is Greek for “push”. One of the unique characteristics of the piezoelectric effect is that it is reversible, meaning that materials exhibiting the direct piezoelectric effect (the generation of electricity when stress is applied) also exhibit the converse piezoelectric effect (the generation of stress when an electric field is applied).

When a piezoelectric material is placed under mechanical stress, a shifting of the positive and negative charge centers in the material takes place, which then results in an external electrical field. When reversed, an outer electrical field either stretches or compresses the piezoelectric material.

The piezoelectric effect is very useful within many applications that involve the production and detection of sound, generation of high voltages, electronic frequency generation, microbalances, and ultra-fine focusing of optical assemblies. It is also the basis of a number of scientific

instrumental techniques with atomic resolution, such as scanning probe microscopes (STM, AFM, etc). The piezoelectric effect also has its use in more mundane.

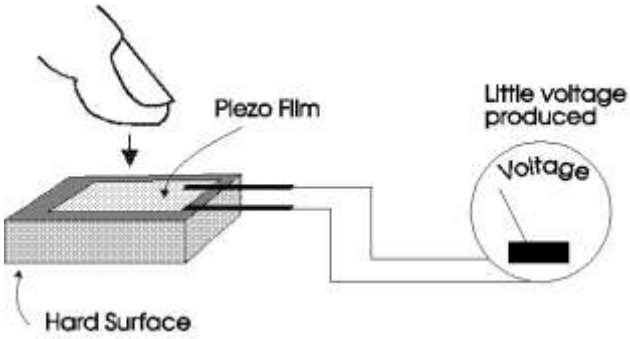

Fig. 4: working of the piezo sensor

Pierre Curie and Jacqueus Curie (brothers) discovered the piezoelectric effect in 1880. Piezoelectricity is a property of a material to generate an electric potential when a mechanical stress is applied to it.

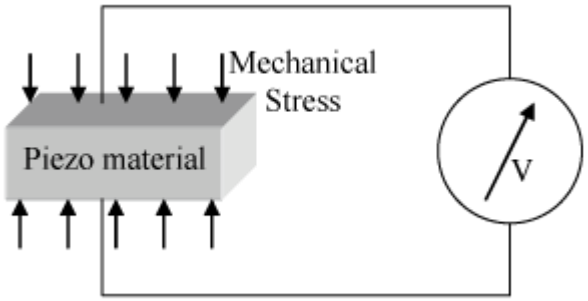

Fig. 5: Piezo Material

In their underlying examinations, the Curie siblings analyzed normally happening materials, for example, Rochelle salt, quartz, genuine sweetener, and topaz. Of the underlying materials analyzed, Rochelle salt and quartz displayed the biggest piezoelectric impact. The primary down to earth use of the piezoelectric impact was in the improvement of SONAR. Quartz precious stones stuck between steel plates were utilized to make high recurrence transducers for use in the SONAR.

Programming necessities

NOOBS: NOOBS is a simple working framework installer which contains Raspbian. It additionally gives a choice of option working frameworks which are then downloaded from the web and introduced. NOOBS Lite contains the same working framework installer without Raspbian pre-stacked. It gives the same working framework choice menu enabling Raspbian and different pictures to be downloaded and introduced.

Raspbian: Raspbian is the suggested working framework for typical use on a Raspberry Pi. Raspbian is a free working framework in view of Debian, advanced for the Raspberry pi hardware. Raspbian accompanies more than 35,000 packages: precompiled software packaged in a decent arrangement for simple establishment on your Raspberry pi. Raspbian utilizes PIXEL, Pi Improved Xwindows Environment, Lightweight as its fundamental work area condition as of the most recent refresh. It is made out of an altered LXDE work area condition and the Openbox stacking window chief with another topic and couple of different changes.

Python: is an open source programming dialect that was made to be anything but difficult to-peruse and effective. A Dutch developer named Guido van Rossum made Python in 1991. He named it after the network show Monty Python's Flying Circus. Python is a translated dialect. Translated dialects shouldn't be aggregated to run. A program called a mediator runs Python code on any sort of PC. This implies a software engineer can change the code and rapidly observe the outcomes. This additionally implies Python is slower than an ordered dialect like C since it isn't running machine code specifically.

Python is a decent programming dialect for fledglings. It is an abnormal state dialect, which implies a software engineer can center on what to do rather than how to do it. Composing programs in Python takes less time than in some different dialects. Python drew motivation from other programming dialects like C, C++, Java, Perl, and Lisp. Python has a simple to-peruse language structure. A portion of Python's punctuation originates from C since that is the dialect that Python was composed in. Be that as it may, Python utilizes whitespace to delimit code: spaces or tabs are utilized to arrange code into gatherings. This is unique in relation to C. In C, there is a semicolon toward the finish of each line and wavy supports ({}) are utilized to aggregate code. Utilizing whitespace to delimit code makes Python a simple to-peruse dialect.

PHP: Hypertext Pre-processor (or just PHP) is a server-side scripting dialect intended for web advancement yet additionally utilized as a universally useful programming dialect. PHP initially remained for Personal Home Page,[3] however it presently remains for the recursive acronym PHP: Hypertext Preprocessor. PHP code might be implanted into HTML code, or it can be utilized as a part of the mix with different web format frameworks, web content administration frameworks, and web structures. The PHP code is typically prepared by a PHP mediator actualized as a module in the web server or as a Common Gateway Interface (CGI) executable. The web server consolidates the aftereffects of the translated and executed PHP code, which might be any sort of information, including pictures, with the produced site page. PHP code may likewise be executed with an order line interface (CLI) and can be utilized to actualize independent graphical applications. The standard PHP mediator, controlled by the Zend Engine, is free programming discharged under the PHP License. PHP has been broadly ported and can be conveyed on most web servers on relatively every working framework and stage, for nothing out of pocket.

JAVA: Java is a broadly useful PC programming dialect that is simultaneous, class-based, question situated, and particularly intended to have as few usage conditions as could be expected under the circumstances. It is expected to give application designers "a chance to compose once, run anyplace" (WORA), implying that aggregated Java code can keep running on all stages that help Java without the requirement for recompilation. Java applications are ordinarily arranged to byte code that can keep running on any Java virtual machine (JVM) paying little heed to PC engineering.

MySql: MySQL (formally articulated as/maɪ ˌɛskjuːˈɛl/"My S-Q-L",) is an open-source social database administration system (RDBMS).[6] Its name is a mix of "My", the name of

fellow benefactor Michael Widenius' little girl, and "SQL", the contraction for Structured Query Language

XML: The Extensible Markup Language (short XML) is a markup dialect like HTML yet is extensible. It's made by the World Wide Web Consortium (W3C). XML characterizes rules for the development of a record. XML adds setting to the data in a report. It doesn't state how this ought to be displayed. Some programs get data out of a XML-archive. To do that, they require an API. There are numerous APIs for XML. You can compose a depiction of a XML archive in a way that is helpful for software engineers. There are a few dialects for this; the best known is called DTD. This comprises of web servers, customer applications and installed programming. The web servers exhibit the center for overseeing, controlling, validating and observing the appropriated framework forms. While the customer applications give graphical UIs (GUIs) for customer's activities. Auxiliary outline including the operational utilization of configuration examples and structures is conveyed in the product framework improvement. The frontend applications incorporate the versatile applications which give graphical interfaces to the control and checking of client's hardware and sensors.. Highlights as adaptability, instinct, memory effectiveness and uncluttered task were considered for more noteworthy client encounter. Further, to empower IoT, the observed information is exchanged to MySQL database server through internet.PHP API executes on the web server. It associates with the MySQL database and returns the information in plain Java Script Object Notation (json), as per the question characterized in it. An android application is created in the Android studio utilizing java and xml. Web association authorizations are given in it to interface. Information from the database (situated in MySQL) can be gotten on the cell phone application at whatever point an activity triggers in raspberry pi. At the point when the android program is clicked, it associates with URL of PHP API. Thus PHP API associates with the database and returns the information to the cell phone.

MySQL can be assembled and introduced physically from source code, however it is all the more normally introduced from a twofold bundle unless unique customizations are required. On most Linux appropriations, the bundle administration benefit, can download and introduce MySQL with insignificant exertion, however, promote arrangement is regularly required to alter security and improvement settings.

In spite of the fact that MySQL started as a low-end contrasting option to all the more intense exclusive databases, it has continuously advanced to help higher-scale needs also. It is still most ordinarily utilized as a part of little to medium scale single-server organizations, either as a segment in a LAMP-based web application or as an independent database server. Quite a bit of MySQL's allure starts in its relative effortlessness and convenience, which is empowered by an environment of open source apparatuses, for example, PHP My Admin. In the medium range, MySQL can be scaled by sending it on more intense equipment, for example, a multi-processor server with gigabytes of memory.

There are, in any case, cutoff points to how far execution can scale on a solitary server ('scaling up'), so on bigger scales, multi-server MySQL ('scaling out') arrangements are required to give enhanced execution and unwavering quality. A run of the mill top of the line arrangement can incorporate an intense ace database which handles information compose activities and is repeated to numerous slaves that handle all read tasks. The ace server ceaselessly pushes binlog occasions to associated slaves so in case of disappointment a slave can be elevated to wind up the new ace, limiting downtime. Promote changes in execution can be accomplished by storing the outcomes from database inquiries in memory utilizing memcached, or separating a database into littler lumps called shards which can be spread over various disseminated server groups.

PHP: Hypertext Pre-processor (or basically PHP) is a server-side scripting dialect intended for web advancement yet in addition utilized as a broadly useful scripting dialect. It was initially made by Rasmos leaf in 1994, the PHP reference execution is presently created by The PHP Group. PHP initially remained for Personal Home Page, however, it presently remains for the recursive acronym Personal Hypertext Pre-processor.

PHP code might be installed into HTML code, or it can be utilized as a part of a blend with different web layout frameworks, web content administration frameworks, and web structures. The PHP code is generally handled by a PHP translator actualized as a module in the web server or as a Common Gateway Interface (CGI) executable. The web server consolidates the consequences of the translated and executed PHP code, which might be any sort of information, including pictures, with the produced page. PHP code may likewise be executed with a Command-line Interface (CLI) and can be utilized to actualize independent graphical explanations.

4. RESULTS and DISCUSSIONS

Front End (Before Execution): The front-End of the mobile application which helps in automating the home security systems where the user can give the voice command to control the sensors which help in detecting the intruders into the house.

Fig. 6: Front End application

Intruder Alarm (After Execution): The application which is used for controlling the home automation sensors by using voice command gets a message every time when there is trespassing happening to his/her house and the user will get information based on this action.

Fig. 7: Intruder Alert

Results in Raspberry pie module

The application which is based on the voice command and can control the house by using automation techniques when the user gives the voice command to resolve the process will go to the server and gets updated and server waits for the raspberry pie to complete the further action. When there is an intruder to the house the sensor detects the pressure and comes as a true message and the user needs to resolve the issue by pressing 1 button so that the process is successful

Fig. 8: Raspberry pie module result

5. CONCLUSION

In this task we centre on the procedure of home security. This strategy for securing home from the robberies, which has turned into a basic piece of regular day to day existence for individuals. The working model we outlined has its point of convergence on home mechanization giving 100% proficiency. The model has its underlying foundations on an IOT stage that enables gadgets to synchronize with the IOT stage so it can send the careful steps or cautions. The stage utilizes the IOT innovation to make a system between the fundamental server and the electronic machines making home a more quick witted place to live in. The entire system comprises of a solitary administrator which makes our model a safe one as the administrator just has the specialist to get to every one of the hubs exhibit under every client. The model is very temperate just as there is just a solitary administrator, however, the quantity of client under the administrator may expand making a substantial complex system yet a safe one. For future work, we would attempt to expand the number of systems under a solitary server making an entire city mechanization utilizing IOT.

6. REFERENCES

[1] J.A. Asensio, J. Criado, N. Padilla, L. Iribarne, Emulating home automation installations through component-based web technology, Future Generation Computer Systems (2017)

[2] Risteska Stojkoska BL, Trivodaliev KV, A review of the Internet of Things for smart home: Challenges and solutions, Journal of Cleaner Production (2016),

[3] Mussab Alaa, A.A. Zaidan, B.B. Zaidan, Mohammed Talal and M.L.M. Kiah, A Review of Smart Home Applications based on Internet of Things, Journal of Network and Computer Applications, http://dx.doi.org/10.1016/j.jnca.2017.08.017

[4] Design, Specification, and Implementation of a Distributed Home Automation System T. A. Abdulrahmana,*, O. H. Isiwekpenia, N. T. Surajudeen-Bakindea, A. O. Otuozea

[5] Major requirements for building Smart Homes in Smart Cities based on Internet of Things technologies Terence K.L. Huia,∗, R. Simon Sherratt a, Daniel Díaz Sánchez b

A. Jacobsson, M. Boldt, B. Carlsson, A risk analysis of a smart home automation system, Future Generation Computer Systems (2015),

[6] Access control in the Internet of Things: Big challenges and new opportunities Aafaf Ouaddah a, ∗, Hajar Mousannif b, Anas Abou Elkalam a, Abdellah Ait Ouahman a Customized IoT enabled Wireless Sensing and Monitoring Platformfor Smart Buildings

[7] Jalpa Shaha *, Biswajit Mishraa a Raspberry Pi as a Sensor Web node for home automation q Vladimir Vujovic´ , Mirjana Maksimovic

