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AUTOMATED ARTIFICIAL INTELLIGENCE SMART HOME SYSTEM

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ABSTRACT:

Nowadays in this generation, the business people are busy with their jobs, the students are busy with their studies as well as the homeowners are busy with their tasks and the disabled person are getting trouble at home in daily life. All of them are pursue after one simple thing which is convenient, efficient will come together with the term convenient. This research is to develop a fully automation smart home system that is "convenient" enough to the users and solve the trouble of disabled people. To acquire accurate data, case study research and online survey will be conducted with the assisting of particular targeted types of users. Instead of offering some aids to the focused targets in a time, a human languages and actions understandable Artificial Intelligent smart home system will be created using deep learning and machine learning technique which lies under the Artificial Intelligence studies to act a role as lifetime assistance for those users. So, the users will not be suffering on their current problem by using this proposed smart home system.

INTRODUCTION

This proposal is about an upgraded version of the current smart home system to help those busy home owner and disabled people. Let us start with the introduction to a normal smart home system before the introducing of upgraded version. The smart home system is the main system of a smart home that used to monitor and manage all those internet-connected smart home devices. The origin of this technology started in 1957, with programming outlets or switches to operate and control the electric wires linked devices [10]. However, by using the current technologies, it is possible to operate the

smart home devices through sensors and wireless signals. Come back to the upgraded version of smart home system, it is purposely focus on busy home owner and disabled people because of its functions and of course It is also welcome to the normal user who intend to use this proposed system. The so-called upgraded version is due to some extra features and functions added inside that will be covered below.

PROBLEM STATEMENT

According to [15], there are a lot of people who are seeking after convenient nowadays due to the tight and busy schedule. So, they do not want to waste any seconds to walk around for monitoring the devices and sometimes will just leave it unopen or opened. Besides, [12] stated that disabled people are getting trouble in daily life because of incapable movement. She also reflects on the issues that arose in the disabled people daily life which including housing. However, the biggest problem in smart home system is the current smart home system is still not smart enough. With the speaking of [16], the smart home system is just a collection of semi-automated ticks and quirks due to the reason that the smart devices are working unexpectedly the other way round. As we can see, the smart home devices are not well trained during the training process.

LITERATURE REVIEW

Automated System

What is automated? As we know, the definition of automated is developing and applying technologies to track and regulate the production and distribution of goods and services [3]. In other words, it is the process of making things to operate itself automatically. Automation can be carried out in many electronics devices no matter how big it is. For an instance, from our smartphone to a car, size is not the problem in performing automation, humans can turn almost everything into automated devices with the technologies and inspiration.

Artificial Intelligence

Artificial Intelligence (AI) is a field of computer science to develop a computer-controlled machine that can perform tasks which usually associated with human intelligence [2]. AI could be a multi-approach knowledge domain discipline, however developments in machine learning and deep learning are inflicting a paradigm shift in nearly each field of the technical school trade presently [1]. We can also explain AI as the human's intelligence which is demonstrated by machines, basically it is the machine that implemented with human's knowledge in order to replace human for performing some specific tasks.

According to [14], AI included 4 main and important components which are expert systems, heuristic problem solving, natural language processing and vision. Without these components, AI will not be able to be formed. The expert system act as a role to manage the situation as an expert and offers productivity. Heuristic problem solving will be intended to test a limited range of solutions, some guesswork can include seeking near optimal solution. Meanwhile, the natural language processing enables human-machine

communication in natural language. Lastly, vision is for AI to be capable of automatically identify shapes, features and etc.

Smart Home

The word “Smart Home” refers to home automation or home domotics (where “domus” stands for home in Latin.) [11]. In essence, smart home is where devices are connected through the internet, thereby allowing devices to be monitored and operated in a ‘smart’ way. The term “smart” is also used in products such as TVs or otherwise known as smart TVs, smart thermostats, smart locks and a lot of other inventions that could evaluate and monitor themselves. Therefore, smart devices are the necessary components to achieve a “Smart Home”.

From the research by [6], smart home is a part of internet of thing and also an organic synthesis of various home-life subsystems using advanced technologies like fibre-optic fiber cable home. Also, smart home shares the resources and connect inside the home, exchange information through home smart devices can be done using home external network.

How do a smart home works? Smart devices operate on the basis of the user’s predefined settings, or by knowing what users want. A terminal or monitor is required to operate such devices or appliances. The users may operate them using remote controls, or the application which installed on their phones, and any smart devices. Even without the users manually making adjustments, such as changing the smart air-conditioner temperature, chips within these devices along with the artificial intelligent algorithms are capable of interacting with the system itself and responding to changes in the environment so it will be giving the user convenience and reducing device management problems [11].

Similar Systems

According to the research, there are some of the famous existed product which act nearly similar to this proposed system. They are Alexa and Sonos.



Figure 1 Alexa with Echo device (Isbitski, 2015)

Alexa, the voiced Artificial Intelligent. It is able to accessed through devices like Echo Dot and Echo Plus. It comes from a company called “Amazon”, the company designed Alexa to mimic a real life conversation, but it can also be used to perform specific tasks like controlling the smart home devices (Rawes & Wetzel, 2020).



Figure 2 Sonos with Sonos Move (S, 2019)

“Sonos”, a leader in home audio which used to control the smart audio devices. Sonos is founded by John MacFarlane in 2002 and it keep improving until today. It also supports for all the major stream services (Kozuch, 2020).

However, there are some differences between the two similar systems and the proposed system.

Below is the table of comparison between similar systems.

System Name	Alexa	Sonos	Proposed System
Supports All Smart Home Devices	No	No	Yes
Sound Recognition	Yes	Yes	Yes
Face Recognition	No	No	Yes
Pattern Recognition	No	No	Yes
Suitable for All Type of User	No	No	No
Allow further Training	No	No	Yes
Chargeable Battery	Yes	Yes	No

For the summary of analysis to the table above, Alexa and Sonos does not supports all smart home devices as Alexa is not purposely built for manage the smart home devices and same goes to the Sonos. Sonos is specially designed for every smart audio playback device so it is considered under the smart home system category. While the proposed system focus on smart home system so it will support every smart home device logically. Then, all three of the system owned sound recognition but only the proposed system managed to have face and pattern recognition for more convenient purpose. Due to the reason that Alexa and Sonos does not implements the face and pattern recognition, they are not suitable for all type of user. For the proposed system, concerning about the user with congenital defect which cannot match with all 3 ways of recognition function, they will be unable to use the proposed system so it is also considered as not suitable for all users. By the way, the proposed system allows the users to do further training or alter the built in actions for completing the intended tasks. Lastly, the proposed system is always plugged in and access to the electricity, it is not necessary to have a chargeable battery.

SIGNIFICANCE OF RESEARCH

The proposed system in this proposal will benefits users like busy homeowner and disabled user. Since it is a smart home system that can be installed by every family in this community, normal user who owned and intend to use this system will also to be benefited in the way as well as two types of user stated above. For the disabled user, the proposed system could be a great Artificial Intelligent lifetime assistance with the functions it has and also the reason that

the disabled user is one of the main targeted user. To the busy homeowner and normal user, they might be benefit even more than the disabled user because of the flexibility of this proposed system. It fitted to most of the user in this community. Thus, the system will perform well regardless of whether it is targeted user or not.

MATERIALS AND METHODS

Research methodology is the techniques for classifying, collecting, processing and interpreting information of a specific topic. Performing research by using the methodologies is the most crucial part in every research paper where it might affect the accuracy of collected data if using the wrong research methods. The chosen methods, case study research and online survey is considered as the best technique to be conducted in this research. Considering both types of research technique, only qualitative research to be executed for precise data, the online survey will be given out as qualitative as well as the case study did. The main reason that the research carries with two different methods but using the same type is to first identify the latest similar product and its specific functions with case study research. Online survey will then be conducted for gathering the ideas and thoughts of users against the old smart home system. Furthermore, approximately 10 journals and 50 online users will be involving in this research. The gathered data will be used as suggestions to improve this system.

Case Study Research

Case study research is a popular technique that has been used widely in social sciences. It is also an analytical analysis that examines a topic in its real-life context (PressAcademia, 2018). Case study research method has the ability to capture the dynamics of real-life circumstances, in order to study the phenomenon in greater detail. Forasmuch as the journals/articles has been done with a lot of researches and proofs, data will be more accurate gathering from them. 10 journals/articles related to the following topic will be used as research for case study to ensure the functionality and the reason why latest smart home is built.

Online Survey

The nature of survey method can be described as “questioning people about a topic or topics and then explaining their responses”. Primary data collection survey method is used in market studies to test ideas, represent people’s attitudes, assess the degree of customer service, perform segmentation research and a number of other purposes. Survey method can be used in both quantitative and qualitative research but in this case, a qualitative online survey will be conducted in order to collect the ideas and thoughts that comes from the community (ResearchMethodology, 2011). As mention earlier, 50 online users of the targeted community will be having their online survey for this research.

Sampling Method

Snowball sampling method used for this research because it is the best method to locate the targeted users in this research. It is hard to find the users who owned and using the smart home system since it is pretty costly in the current

generation. It is harder to find the smart home system user who is actually disabled. Not only that, self-selection sampling is also chosen for this research. To identify the specific cases of this research, this method is importantly needed. Targeted users will be any ages of normal smart home system, busy smart home user and disabled smart home user.

RESULTS AND DISCUSSION

Automated Artificial Intelligence Smart Home System

Automated AI smart home system is focused to be developed. In this system, the system will be installed with Artificial Intelligence knowledge which is deep learning and machine learning in order to have the system understand human languages and actions. Besides, every house that uses this smart home system will need to build in some 24hour functioning audio camera and heat sensors to be linked with the system. This camera is responsible to pass commands of the user to allow smart home system monitors and controls the specific smart devices. The smart home system has some different functions which doesn't owned by the common smart home system.

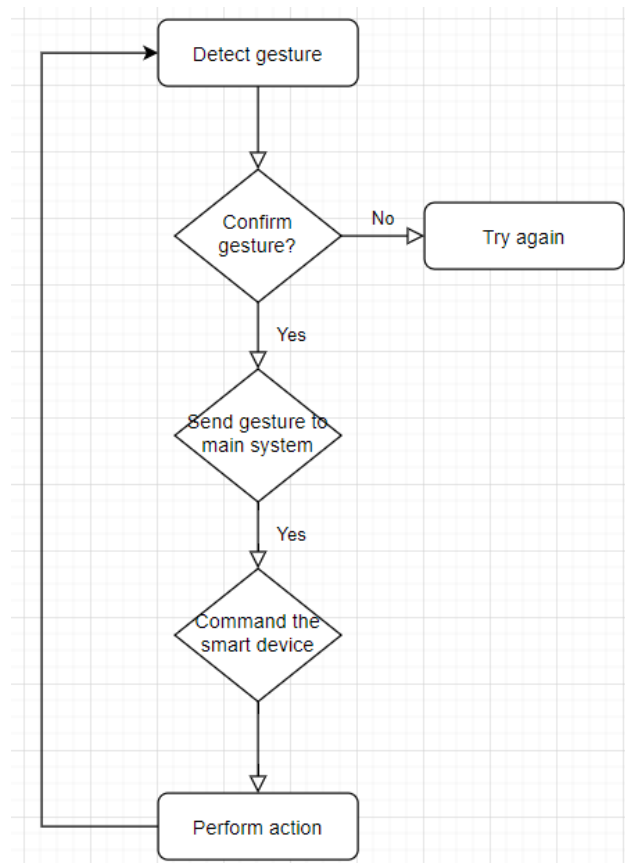


Figure 3 Flowchart of the system

Firstly, it has the face recognition for unlocking service, responsible to the safety security. Only the owner and family members can access after identify their faces. So, there will be no stranger who manages to use this system accessed in. Furthermore, the system works not only with voice recognition, also with pattern recognition which means the user can train (insert) the system with their own gesture following their interest to the specific tasks. It is not necessary follows the instructions to perform the commands.

Moreover, considering privacy to the owner, smart devices in toilets, bathroom or any private spaces will be executing through the smart home system with the commands from heat sensors. With concerning of disabled people who are not capable of seeing, listening, voicing and moving, there will be special automation for those specific person. The details are stated below.

For user who is not capable of seeing/ moving, they can control via voice and pattern commands. The user who is not capable of listening/ voicing able to control the system through pattern commands. Besides, for the user who is fully disable desire to use the system, there will be a preset automation timer setting available for them.

This proposed smart home system is a very flexible system where the common instruction of system is needlessly. So, based on the user's behavior/habit, it can be changed the way according to the user.

CONCLUSIONS

Throughout this entire research paper, it is clearly stated that why a lot of people are currently using smart home system and the discussion on smart home system. The previous studies on smart home system act as an important role in assisting this research paper and also lead to this multi-functioning proposed smart home system. By using this proposed system, many people and disabled person who is struggling of getting a "convenient" daily life will be well benefited. However, the proposed system still has a lot of room for improvement to become a greater and useful system in the future.

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REFERENCES

- BuiltIn, 2019. *Artificial Intelligence*. <https://builtin.com/artificial-intelligence>
- Copeland, B., 2020. *Artificial intelligence*.
<https://www.britannica.com/technology/artificial-intelligence>
- International Society of Automation, 2020. *What is Automation*.
<https://www.isa.org/about-isa/what-is-automation/>
- Isbitski, D., 2015. *Introducing the Alexa Skills Kit, Enabling Developers to Create Entirely New Voice Driven Capabilities*.
<https://developer.amazon.com/blogs/post/Tx205N9U1UD338H/Introducing-the-Alexa-Skills-Kit-Enabling-Developers-to-Create-Entirely-New-Voice>
- Kozuch, K., 2020. *What Is Sonos? How the Speakers Work (and What They Work With)*. <https://www.tomsguide.com/us/what-is-sonos,review-5140.html>
- Li, M. et al., 2018. Smart Home : Architecture, Technologies and Systems. *8th International Congress of Information and Communication Technology*, Volume 131, pp. 393-400.

- PressAcademia, 2018. *Definition of Case Study*.
<https://www.pressacademia.org/definition-of-case-study/>
- Rawes, E. & Wetzel, K., 2020. *What exactly is Alexa? Where does she come from? How does she work?* <https://www.digitaltrends.com/home/what-is-amazons-alexa-and-what-can-it-do/>
- ResearchMethodology, 2011. *Survey Method*. <https://research-methodology.net/research-methods/survey-method/>
- Rouse, M., 2005. *IoT Agenda*.
<https://internetofthingsagenda.techtarget.com/definition/smart-home-or-building>
- Rouse, M., 2018. *smart home or building (home automation or domotics)*.
<https://internetofthingsagenda.techtarget.com/definition/smart-home-or-building>
- Ryan, F., 2017. *The Guardian*.
<https://www.theguardian.com/inequality/2017/nov/15/whats-life-really-like-for-disabled-peopl-d-disability-diaries-reveal-all>
- Singh, G., Mishra, A. & Sagar, D., 2013. An Overview of Artificial Intelligence. *SBIT Journal of Sciences and Technology*, 2(1), pp. 3-6.
- S,R., 2019. *Introducing Sonos Move, Brilliant Sound Anywhere*.
<https://en.community.sonos.com/announcements-228985/introducing-sonos-move-brilliant-sound-anywhere-6829500>
- Tolin, L., 2017. *BETTER*. nbcnews.com/better/careers/busy-trap-how-keeping-busy-became-status-symbol-n742051
- Ulanoff, L., 2018. *OneZero*. <https://onezero.medium.com/smart-home-technology-is-still-not-smart-enough-1379d9e6530f>