

Smart Door Bell System

Megha Lakhwan¹, Shivani Kumari²

B-Tech, CSE Department, PDM University, Bahaurgarh, Haryana, India

Abstract: *The use of Artificial Intelligence (AI) in smart home technology has been on the rise in recent years. One such application is the smart doorbell system, which uses AI to enhance security and convenience for house owners. In this paper, we explore the functionality of smart doorbell systems, their architecture, and the role of AI in enabling the automation and enhancement of various features. We analyse the benefits of AI-powered smart doorbell systems in providing a more personalized experience to users, enhancing security measures, and providing convenience in daily life. We also discuss the challenges and limitations faced by the implementation of AI in smart doorbell systems and suggest good solutions to overcome them. The smart doorbell system is a modern security system that provides house owners with better security and convenience. With the help of AI it improves the overall functionality of the system. AI is a rapidly developing technology that has the potential to change various industries, including home security. In this paper, we will explain all the possibilities of smart doorbell system for the betterment of it and to enhance its usage. There are few equipment that are included in all kinds of smart door bell system like a microphone, a camera, a speaker and maybe a motion detection sensor these all equipment's are integrated together to give a better and convenient home security for the house owners. This paper aims to provide an overview of smart doorbell system including their features, pros and cons and some suggestion for future aspects after reading reference papers.*

Keywords: smart doorbell system, recognition, camera, database, security.

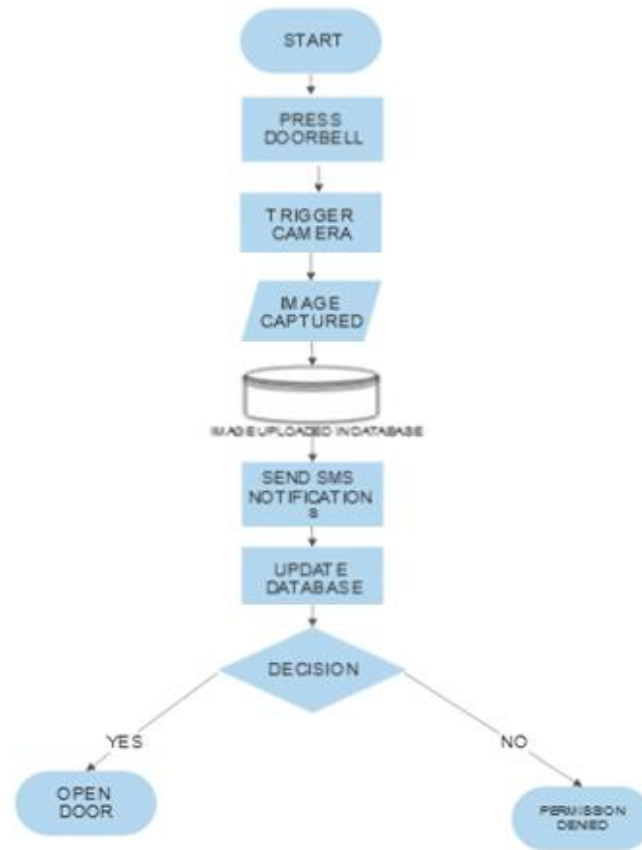
1. Introduction

The term **artificial intelligence** was first coined decades ago in the year 1956 by John McCarty at the Dartmouth conference. He defined artificial intelligence as the science and engineering of making intelligent machines. Artificial intelligence is basically a method of making a computer or a software think like the human mind. It is composed of two words (Artificial -man made) and (Intelligence – thinking power). In other words we can say that Artificial is non-natural and Intelligence is basically ability to understand, think and learn. It is a branch of computer science by which we can create intelligent machine which can behave like a human and think like humans and able to make decisions. It is a study of how the human brain thinks, learns, decides and work, when it tries to solve problems. In simple terms, Artificial intelligence refers to the ability of machines or computer programs to carry out certain tasks that require human being to use their intelligence. There are various uses or applications of artificial intelligence – Healthcare, finance, manufacturing, transportation, gaming, data security, social media, entertainment, agriculture, robotics, education etc. AI is not restricted to only machine learning and deep learning it covers a vast domain of fields including natural language processing, object detection, computer vision, robotics expert system and so on. There are also three types of artificial intelligence which are – Artificial Narrow Intelligence, Artificial General Intelligence and Artificial Super Intelligence. In Artificial Intelligence user does not need to pre program a machine to do some work. User have to create a machine with programmed algorithm which can work with own intelligence. There are various advantages of AI such as high accuracy with less errors, high speed, high reliability, useful for risky areas, digital assistant, useful as public utility and various disadvantages of artificial intelligence are high cost, can not think out of box, no

feeling and emotions, increase dependency on machines, no original creativity.

Smart doorbell system :-IOT (Internet of Things) become very important in today's technology and it has multiple uses when it comes to our homes. Smart door bell system is one of them. Smart doorbells are similar to security or servillance cameras but they have a button that visitors can press to get your attention. It is connected to wi-fi network and integrated on your mobile. Smart doorbell can capture the visitor at the door and then transfer that information to the cloud or any storage devices. Smart doorbell are based on different methods or smart surveillance such as image, audio and video etc. Basically the purpose of smart doorbell system is to make home or office or any area security. It is used for security specially for children and old people. When someone presses the doorbell, an SMS will be sent to the registered mobile number and then the response in the form of SMS displayed on the screen beside the door so the visitor can read the SMS and act accordingly or the doorbell make a video call to the registered number. It provides security such as it monitors your maintenance 24*7, Infrared LEDs allow you to view and record footage even in dim lighting. It also supports full HD resolution for recording and viewing. There are two types of smart doorbells -wired and wireless. A wired link connects doorbell to your home through wires and a wireless doorbell link to the wi-fi network. Various smart doorbells have various functions such as image based smart doorbell works on images instead of videos which gives high level of reliability and safety. A smart doorbell using federated learning model is used to reduce the object detection latency. Dashbell is another kind of smart doorbell which involves fast fault detection and diagnosis.

A diagram showing the working of regular smart doorbell system using SMS system



2. Literature Survey

Paper's Name	Year	Author	Journal	Proposed Problem	Proposed Solution
Image based smart surveillance and remote door lock switching system	2019	Jay Patel*, Sundar Anand, Rohan Luthra	International Conference on recent trends in advanced computing 2019, ICRTAC2029	CCTV cameras or any video system require high consumption, high internet traffic, cost efficient.	Service oriented architecture is developed which works on images instead of videos which gives high level of reliability and safety.
Smart Electric home security system.	Volume1 18No.18 2018,255-261	Dr V KHANAA, Dr M. Sundararajan, Professor, BIST, Bharath Institute of Higher Education and Research. Bharath University	International Journal of Pure and Applied Mathematics	Proper locking mechanism, safety is not there.	video door phone system, home security, intruder alert, android notifications is used which overcome the shortcomings of traditional video door phones by giving remote access and adding a surveillance system and proximity trigger.
A demonstration of smart door bell design using federated deep learning	19, Oct 2020	Vatsal Patel, Sarth Kanani, Tapan Pathak, Pankesh Patel, Muhammad Intizar Ali, and John Breslin	Report of the HPC Correctness Summit, Washington, DC	Existing approaches of sending video streams to a centralized server(or Cloud) for video analytics have been facing many challenges such as latency, bandwidth cost and more importantly users' privacy concerns	The proposed smart door bell design reduces communication cost, Second, the smart doorbell deploys On-Device Federated model to reduce the object detection latency. Finally, it exchanges model instead of exchanging images, which provide with a sense of preserving privacy
Dash bell: A low-cost smart doorbell system for home use	16-06-2023 2017	Bradley Quadros, Ronit Kadam Devendra Lavaniya, and Muhammad Mukhtar	International Journal of Research in Engineering, Science and Management	The commercial smart doorbells are quite expensive, usually cost more than190US dollars. The high prices make these products unavailable to most home users with limited budgets	Dash bell is introduced that utilizes the Amazon dash button and existing devices in modern homes to develop a budget solution for users It costs less than40 US dollars compared to199 US dollars for a single smart doorbell available in market. It also involves fast fault detection and diagnosis.

Automatic door opening system	Volume-2, Issue-3, March-2019	Shashikant Mahajan ¹ , Payal Patel ² , Mansi Chavan ³	International Journal of Research in Engineering, Science and Management	Multilayer of security specially for children and elder people.	The aim is to provide a door entry system based on SMS that gives the flexibility of remote access control while ensuring security. The command to open the door is known only to the host. This adds another layer of security.
Smart Surveillance with Smart Doorbell.	SSN: 2278-2075, Volume-8 Issue-8, June 2019	R.V. S.Lalitha, Kayiram Kavitha, N V Krishna Rao, G. Rama Mounika, V. Sandhya	International Journal of Innovative Technology and Exploring Engineering (IJITEE)	People do not get aware or alert when someone is at their door so this system will alert people inside home.	Whenever the system detects an object, it alerts the user with an alarm and also by sending an e-mail with the image of the object as attachment to the mail. As future work, we have plans to identify the object too with some training data given to the system so that the system itself can identify the object before sending the alert.
Smart Doorbell Using ESP32 Cam Based on IoT	Volume 3, Issue 3 (May-June 2022), PP: 290-292.	Aparna T G ¹ , Aravind Krishna ² , Ardra N P ³ , Asha Rose Thomas ⁴ Computer Science, Adi Shankara Institute of Engineering and Technology, Kalady. Kerala, India	International Journal of Innovative Research in Engineering	To ensure safety, the owner will keep the door locked at the time. Often, when leaving the house in a hurry, the owner forgets to lock the door or may not be aware that the door is locked.	With the WiFi Door Lock with ESP32 CAM, you'll be able to monitor the status of your door, control it, and enhance home security using Internet of Things (IoT) technology.
Smart Doorbell Security System Using IoT	September 21, 2020	Udit Chaudhari, Sushmita Gilbile, Gayatri Bhosale, Nishigandha Chavan, Prashant Wakhare	Easy Chair Preprint.	Double security with the help of OTP.	This system can also be reconfigured to detect the intruder who are not pressing the doorbell, whose face get captured and follows the same authorization process to know the intruder who tries to open the door. Which can be very useful to monitor the home remotely.
Face Recognition Technology based Smart Doorbell System using Python's OpenCV library	Vol. 10 Issue 06, June-2021	Shweta Malve and Dr. S. S. Morade Department of Electronics & Telecommunication KKWIEER Nashik Maharashtra, India	International Journal of Engineering Research & Technology (IJERT)	A system with the ability to detect and recognize faces has many potential outcomes not just in crowded places but in home security systems as well. One such application of automating the household doorbell can not only solve the security issues but also offer extra flexibility to smart house control by recognizing the person at doorstep and announcing the name.	This work is aimed to build a complete system for face recognition which is easy, low-power and cost-effective. Its utility is to be set as an alert for home visitors and provide information about the visitors for the persons with disabilities
Smart Doorbell System based on Face Recognition	Volume: 04 Issue: 03 Mar - 2017	Jaychand Upadhyay, Parkar Rida, Sunidhi Gupta, Noman Siddique	International Research Journal of Engineering and Technology (IRJET)	How will people inside or outside home will recognize who is at the door?	Our proposed system will be helpful for those who aren't at home most of the times and need to keep track on visitors. Its utility is to be set as an alert for home visitors and provide information about the visitors in a dynamic website and phone application.

Pros of having a Smart Doorbell System

There are many benefits of having a smart doorbell system it will have the ability to see the real-time pictures of the person or intruders approaching at the door and can communicate with them regardless of one's location. It is also very beneficial for people with physical disability or older people at home who can monitor the door to lock or unlock with their phones without changing positions.

If the house owner is not available at home then a video doorbell system allows us to have a two way communication with the outsider without opening the gate. They can remotely communicate via smart phone and the visitor won't

even know it. This intercom-style feature comes in handy when you're working, out of town, or if you're out for a jog around the block. Thieves often target homes that look empty. Therefore, answering when someone rings the doorbell—especially when you're not home—gives a potential burglar the impression that you're talking from inside the house.

When the footage from cameras saved on cloud storage, it mitigates the risk of anyone damaging the camera. Even if they succeed in destroying the camera of smart doorbell, it won't affect the footage as that is stored somewhere safe, that means we will get the footage at any cost, and if we want to see what happened at the door at any time, we can

download the footage directly from the cloud and share it with anyone when needed.

At night it may happen that we cannot recognize people standing at our gate or door, but we for surely need a clear picture of the person before letting them inside the house. DFS smart doorbell will help to see a clear picture before opening the door. In that DFS doorbell night vision is activated at night or when it is dark.

Consequences of having a Smart Doorbell System

We all know every technologies comes with cons and pros, so does smart doorbell system. Despite of all the others advantages or benefits there are few drawbacks like the main drawback is an internet connection, the smart doorbell system needs a good internet connection to work properly with application running on the mobile phone and there can be some systems which may be vulnerable to hacking or other security breaches, and people might also feel very intrusive and inappropriate with the constant notification on their phones.

All the smart doorbell systems will not be compatible with all types of doors, some people have older homes and they have to pay more amount for all the installation process.

Another drawback is what is the system does not work properly in different weather conditions like heavy rain or extreme cold. It also has very high energy consumptions.

Another challenge is the reliability of the system. The system relies on deep learning algorithms, which can be affected by environmental factors, such as lighting and weather conditions. It is important to ensure that the system is tested under various conditions to ensure its reliability.

Future aspects that can be evolved in upcoming time:-

Few aspect can be integrated with the evolving/ developing Technologies like database or the smart doorbell system will be allowed to identify few people itself like family members, friends, and few other people who visits daily and opens the door automatically. Owner can modify the database according to their need for safety purpose, captured image will be saved in database for knowledge of owner to see the date as well as time while person is pressing the doorbell.

Another major aspect to increase the security of the house is that it can be integrated with an OTP system so that it will be more secure for the house. For example if there are children at home and they press the door button to open the gate without knowing who is at the gate then this OPT system comes in handy there. Where only the elders of the house will have the access to the OTP system.

Integrated Ai smart doorbell system embedded with sensor can be a great idea too, where this sensor can help and detect the temperature, humidity and air quality inside the house and control them at normal level or give alerts notification.

3. Conclusion

Smart doorbell systems using AI technology have enhanced the functionalities and capabilities of these devices, making

them more intelligent and efficient. The use of AI algorithms such as NLP and ML has made it possible to control the smart doorbell system using voice commands and learn from homeowner preferences. It is very good and innovative technology to install smart doorbell system, however it has some drawbacks but with the evolution in technology, it can also be evolve and become more advanced doorbell system in future and can be a good security system to invest money in order to keep the house safe and secure.

References

- [1] Smart Surveillance with Smart Doorbell R.V. S.Lalitha, Kayiram Kavitha, N V Krishna Rao, G. Rama Mounika, V. Sandhya 7.Smartsurveillance.pdf
- [2] Smart Doorbell Using ESP32 Cam Based on IoT 1654079995_f9e259d0d9e37add9f0a.pdf
- [3] Smart Doorbell Security System Using IoT EasyChair-Preprint-4228.pdf
- [4] Face Recognition Technology based Smart Doorbell System using Python's OpenCV libraryIJERT_Face_Recognition_Technology_based.pdf
- [5] Smart Doorbell System based on Face Recognition Smart_Doorbell_System_based_on_Face_Reco.pdf
- [6] A Demonstration of Smart Doorbell Design Using Federated Deep Learning<https://arxiv.org/pdf/2010.09687.pdf>
- [7] Dashbell: A Low-cost Smart Doorbell System for Home Use<https://arxiv.org/pdf/1706.09269.pdf>
- [8] Image-Based Smart Surveillance and Remote Door Lock Switching System for Homes
- [9] <https://www.sciencedirect.com/science/article/pii/S1877050920300648>
- [10] https://d1wqtxts1xzle7.cloudfront.net/56000868/29-libre.pdf?1520516949=&response-content-disposition=inline%3B+filename%3D29_pdf.pdf&Expires=1682175185&Signature=FKAAKBCdp2ubQS7cADSDcybBqcBjTd7NKKfFNzWQCZ2KABRR~Ltw~UmBx71j3VxJooHIX-8MxbDnSI1QoyD~jpnPYu2DZdiqF1RzvC1-x9kzTmypBLdHuSxi615GyjINMXNjKnesui44gm1VJVIErNS0dNGF3A394Bsnxon86uMguIvKi62WiUoBesuwmsrz3zmXaQNr2cm8rtIKA9IT-r1XSqAXST3sauphEW~96guQAyZpldmmJ5HayKn7hpoDtLZZ1ervlg2rs7uoFcAV-wrwbQcFF4p9mB7IvfcvKnOVJCODhs9GmckIrby~ohaoD~ou7YUCOsnZ2B5m5PDiqQ__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA29_pdf.pdf
- [11] https://www.ijresm.com/Vol.2_2019/Vol2_Iss3_March19/IJRESM_V2_I3_185.pdfhttps://www.ijresm.com/Vol.2_2019/Vol2_Iss3_March19/IJRESM_V2_I3_185.pdf