

# A Review of Home Automation Systems

Divyang Modi

Department of Computer Engineering  
Institute of Technology, Nirma University  
Ahmedabad, Gujrat, India  
divyangmodi7@gmail.com

**Abstract** - A considerable amount of advances utilized in smart homes can be adjusted to meet various necessities. By realising and implementing these innovations in homes can dispense the need of care and allow freedom to the individuals who may struggle coping up with everyday exercises or in conditions of visual deficiency, dumbness or motionlessness. This paper means to talk about home automation frameworks for the physically impaired by the means of speech recognition and device control with inserted frameworks. An idea of machine learning is examined which is a technique for information investigation that computerizes scientific model structures. Machine learning trains PCs to perform undertakings and gives yield without being expressly programmed. The framework utilizes machine learning procedures by watching conduct of an individual at a specific time, condition, climate and daily routine tasks and provides output. Ant colony optimization and decision tree algorithm are assessed for surmised solutions in troublesome advanced issues which make the framework more brilliant with the terms of accurate decisions and feature selection.

**Keywords** – Artificial intelligence, speech recognition, machine learning, Ant Colony Optimization, signal processing, decision tree.

## I. INTRODUCTION

Artificial Intelligence is the capacity of PC or other machine to perform activities that requires intelligence. Among these activities are sensible inference and deduction, imagination and the capacity to settle on choice dependent on their past experience. It might be deficient data, yet it has the ability to comprehend spoken dialect. Self-driving cars face recognition, web search, industrial robots, missile guidance, tumour detection and many more real time complex problems have already been mitigated, if not completely solved with the utilizations of the artificial intelligence. Natural language is an artificial intelligence specialization that forms the human regular dialect and prepares PCs to give reaction.

Speech recognition is a standout amongst the most mind boggling zones of software engineering and partly as a result of its interdisciplinary. Speech is normally dynamic in nature. There are numerous methodologies utilized in speech recognition; to be specific artificial neural networks (ANN), pattern recognition, and language modelling and statistical analysis. In the essential model of speech recognition pre-processing, include extraction and displaying is performed. The AI field teams up with designing, maths, semantics, brain research, philosophy, neurobiology, and artificial logical order. Self-driving cars, facial recognition, growth acknowledgment and web seek, mechanical robots, missile directing growth detection and a bunch of other

complicated real life issues have effectively been unravelled with the uses of the fake intelligence.

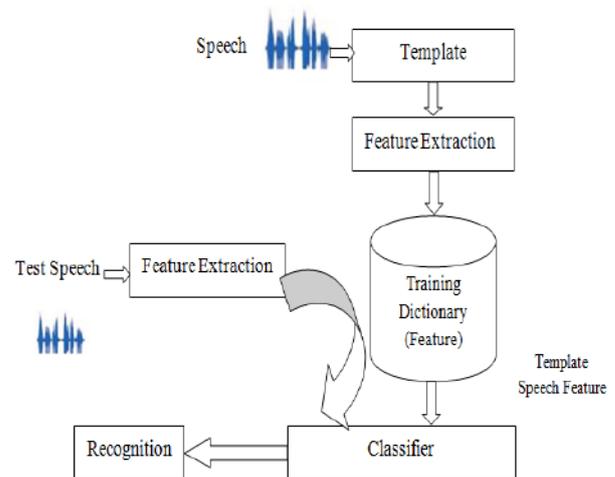


Fig.1 Basic working of Speech Recognition.

Machine learning is a strategy of data investigation that automates systematic model building. These calculations that iteratively learn from data, machine learning grants framework to look out concealed bits of knowledge while not being explicitly modified wherever to appear. There are many learning calculations like supervised, unsupervised, semi supervised learning and transduction learning which are ordered for special purpose undertakings. These calculations help to

comprehend the idea and to use in a proper way. A decision tree is regulated learning calculation in which internal nodes speaks to relate quality, each branch speaks to result of the root issue and each leaf node speaks to arranged information that computes all properties. It is a standout principal among the procedures utilized in classification. Tree is built in a top down way and models are ordered in root-leaf structure to address any issue.

As per paper [8], Decision tree algorithm has uniqueness for being converting and effectively fit for the standards of grouping and expectation. This paper has acquainted an algorithm to develop a decision tree with less unpredictability and with a simpler approach, thinking about couple of parameters. In case of a smart home design, decision tree algorithm functions admirably and gives effective parameters for classification.

Ant colony is an idea of self-sorting out rule which permits exceedingly organized conduct and finds an answer with harmony. A few distinct parts of the conduct of ant colonies have roused various types of ant algorithms. Scrounging, division of work, brood arranging and cooperative transport are such models. Ant colony streamlining (ACO) is a standout amongst the best instances of ant colony algorithms motivated by searching and learning conduct of ants. A unique hormone created by ants is pheromone which works as the building block for communication between ants. By detecting pheromone trails foragers can pursue the way from food source to their homes. This trail-following conduct whereby an ant is affected by a concoction trail left by different ants is the motivating idea of ACO.

## II. LITERATURE REVIEW

The significant procedures of speech recognition incorporate element extraction, acoustic demonstrating, elocution modelling and decoder. The end client traverses the application by the means of an appropriate input device, for example a microphone. Sound waves travel in the form of simple analog signal hence the recognizer first acknowledges them as an analog signal and transforms them into digital signals. The penultimate portion of paper [2] demonstrates that Computers would rapidly touch base with preinstalled programmed speech recognition frameworks. Hardware and gadgets with this innovation would enhance the lives of the visually impaired, the hard of hearing, and other physically tested individuals by giving them access to PCs without the click of buttons.

The smart interface has been produced in first research [3] to assist individuals with handicaps at working environment. It has utilized assistive advances to

actualize Real time location systems (RTLS) that works with RFID labels and communicates through the Wi-Fi arrangement in the building. In this paper an algorithm is utilized named the event and noting algorithm which screens the occasions intermittently (every 4 hours) set up by incapacitated individuals just as their location to decide how to intervene them and their overseers.

According to [4] ACO is the heuristic algorithm for solving difficult combinatorial problems. The pheromone can be considered as a numerical data for giving probabilistic solutions. The components of ACO are large enough to provide a number of solutions, but have heuristics to select perhaps the most promising outputs. This paper concludes some final procedures to implement ACO met heuristic..

- Initialization
- Construct Ant solutions
- Apply Local Search
- Global Update Pheromones

By the reproduced outcomes examination, this proposed algorithm has given ideal arrangement with higher performance. Yet to refresh the pheromone persistently well communication, intensification and expansion is required for a few parameters. In the correlation of genetic algorithms, evolutionary programming, mimicked tempering and ACS, self-evolving ACO gives an ideal arrangement with adjusting different factors with regards to TSP.

A modified version of the above algorithm – the efficient ant colony optimization (EACO) algorithm has been introduced in paper [5] which improves the standard ACO algorithm for combinatorial, continuous and mixed variable optimization problems by bringing forth the sampling technique.

In combinatorial ACO algorithm, the change likelihood that assistance to pick the following arrangement part and for ceaseless and blended variable advancement issues, the likelihood of picking insect manage and the conveyance of the arbitrary numbers produced for the acknowledgment likelihood of an answer segment influences the execution of the ACO algorithm. EACO algorithm is produced dependent on effective testing procedure that keeps the assorted variety and the multidimensional consistency property of tests.

In the network to solve routing problems, a different concept of ACO has been implement in paper [9] called the multiple ant colonies optimization (MACO). This algorithm brings forth various ant colonies to simulate the competition for load balancing within the network resources allocation. A new direction of ACO researches that emphasizes on enhancing the performance of ACO and mitigating the effect of search

stagnation is the use of Multiple Ant Colonies Optimization (MACO) where several ant colonies work in harmony to collectively solve a given optimization problem.

Utilizing adaptive adjustment technique and parity factor an algorithm has been developed in paper [10] named IMVPACO Algorithm (improved ACO) to take care of the famous Travelling Salesman Problem (TSP). Concluding the analysis, as per the obtained results, IMVPACO algorithm proved to be superior to the customary ACO as far as finding ideal solution and lesser iterations was concerned.

Table 1 Variations of the Ant Colony Optimization (ACO) Algorithm.

| Name of Algorithms                         | Technique Used                                      | Problems mitigated                        |
|--|---|---|
| Efficient Ant Colony Optimization (EACO)   | Sampling Technique                                  | Combinatorial and Continuous Optimization |
| Improved Ant Colony Optimization (IMVPACO) | Adaptive Adjustment Strategy                        | Travelling Salesman Problem               |
| Memory Based Immigrants (MIACO)            | Combines immigrants and memory                      | MP Hard problems and DTSP                 |
| Multiple Ant Colony Optimization (MACO)    | Load Balancing Technique                            | Routing Problems                          |
| Self-Evolving Optimization                 | Balance between intensification and diversification | Travelling Salesman Problem               |

## VI. CONCLUSION

Artificial Intelligence has an exceptional impact in home automation with the new rising advancements and learning strategies. For physically tested individuals, automating the house by implementation of speech recognition by installing equipment of home with the framework can be largely advantageous and helpful. Ant Colony Optimization indicates adaptability with various systems and takes care of numerous issues. Also, Decision tree algorithm is helpful in an equivalent viewpoint in smart home mechanization. So the key idea is to amalgamate ant colony optimization and decision tree machine learning which will make a framework with high accuracy of decision making just as learning itself. This sort of framework can help the impaired to manage and go about their tasks easily and efficiently.

## REFERENCES

- [1] Macro Dorigo And Thomos Stutzle, "Ant Colony Optimization", A Bradford Book MIT Press Cambridge 2004
- [2] Seema Rawat, Parv Gupta, Praveen Kumar, "Digital Life Assistant Using Automated Speech Recognition" International Conference On Innovative Applications Of Computational Intelligence On Power, Energy And Controls With Their Impact On Humanity (CIPECH14) 28 & 29 November 2014.
- [3] Ghassankbar, "Smart Behavior Tracking System For people With Disabilities At The Work Place", 2015 Ninth International Conference On Sensing Technology
- [4] Macro Dorigo And Thomos Stutzle, "Ant Colony Optimization: Overview And Recent Advances", In IRIDIA , Technical Report Series, May 2009.
- [5] Urmila M Diwekar And Berhane H Gebreslassie, "Efficient Ant Colony Optimization (EACO) Algorithm For Deterministic Optimization" , International Journal Of Swarm Intelligence And Evolutionary Computation 2016.
- [6] Xiao-Fan Zhou And Rong-Long Wang, " SELF-EVOLVING ANT COLONY OPTIMIZATION AND ITS APPLICATION TO TRAVELING SALESMAN PROBLEM" ,International Journal Of Innovative Computing, Information And Control ICIC International 2012 ISSN 1349-4198 Volume 8, Number 12, December 2012.
- [7] Michalismavrovouniotis And Shengxiang Yang, "Memory-Based Immigrants For Ant Colony Optimization In Changing Environments", Department Of Computer Science, University Of Leicester United Kingdom.
- [8] Neha Patel And Divakar Singh, "An Algorithm To Construct Decision Tree For Machine Learning Based On Similarity Factor", International Journal Of computer Applications Volume 111 – No 10, February 2015.
- [9] Ms. Meenakshi R Patel And Ms. Babitakubde, "A Survey Paper On Ant Colony Optimization Routing Algorithm For Selecting Multiple Feasible Paths For Packet Switched Networks", IJCSI International Journal Of Computer Science Issues, Vol. 9, Issue 2, No 3, March 2012.
- [10] Ping Duan And Yong Ai, " Research On An Improved Ant Colony Optimization Algorithm And Its Application", International Journal Of Hybrid Information Technology Vol.9, No.4 2016