IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Vol.-6, Issue-11, Nov 2018 E-ISSN: 2347-2693

Agent Based Access Point Selection Mechanism

Vinodh P. Vijayan[1*], Neema George[2], Simy Mary Kurian[3], Sujitha M.[4]

[1,2,3,4]Department of CSE, MangalamCampus, Ettumanoor, Kottayam, India

**Corresponding Author: vinodhpvijayan@yahoo.com, Tel.: 9961687007*

Available online at: www.ijcseonline.org

Accepted: 25/Nov/2018, Published: 30/Nov/2018

***Abstract*—** The last few years have visible a brilliant boom in the deployment of 802.Eleven Wireless Local Area Networks (WLANs). The proliferation of wi-fi users and the promise of converged voice, information and video technology is predicted to open new numerous possibilities for 802.Eleven based totally WLANs in the networking market.When the WLAN design turned into first advanced in 1990, the model assumes that a WLAN deployment accommodates one stand on my own Access Point (AP).In truth, any such device gives exceptional consumer experience as lengthy as there may be few customers with exceptionally light site visitors load and one AP. Due to fast boom of wireless users and the requirement for continuous insurance, multi-AP WLANs now a days span homes or floors. Some neighboring APs have to be configured on the same channel due to the constrained quantity of channels the 802.11 fashionable supports.In WLANs frequently a station can doubtlessly companion with multiple AP. Therefore, a relevant query is which AP to pick out great from a list of candidate ones. In IEEE 802.Eleven, the consumer certainly buddies to the get entry to factor with the most powerful acquired sign strength.Hence a multiobjective technique(ie.More than one parameters are taken into consideration)and fuzzy primarily based selection making is proposed.Here every node are handled as agent which looking to access first-class AP.Fuzzy based totally decision making ensures effective usage of professional information.

***Keywords*—** WLANs, mutiobjectivetechnique, Fuzzy, AP

I. INTRODUCTION

Wireless Local Area Networks (WLAN)[8]are rapidly becom- ing a normal part of the communications access infrastruc- ture.Due to their low cost,simplicity of installation and high data rates, demand for wireless LAN products has grown dramatically over the last few years,and it shows no sign of slowing. Indeed,it is strengthened by the growth of laptops and personal mobility products.With the spread of wireless LAN as a way to access to the Internet,the number of stations (STAs) connected with the wireless LAN are also increasing.However, with the increase in STAs in the wireless LAN, achievable throughput per STA decreases because they share the commu- nication resource provided by access points (APs).Therefore, multiple APs are required to serve many STAs and to improve the transmission capacity in the wireless LAN. In fact, IEEE 802.11 wireless LAN can extend the communication range by using the multiple APs. In wireless LAN constructed with multiple APs,the following significant issue can arise:how to select an appropriate AP among available APs.In the existing architecture, the received signal strength[1] is usually em- ployed to select an AP. However,such AP selection strategy causes the concentration of STAs to specific APs: many STAs may associate with only a few APs because their signal strengths measured by the STAs are strong, while only a few STAs may associate with the remaining APs. This results in an imbalanced traffic load among APs in the wireless LAN. Internet of Things.

II. OVERVIEW OF WLAN

Mobile computing has come to be extraordinarily famous in to days society. Todays Internet has large boundaries, while it corresponds to the mobility. For an instance, if person need to be connected to the Internet through a bodily cable, their pass- ment is dramatically limited. On the alternative hand, wireless connectivity poses no such restriction and allows a great deal greater loose movement at the part of the network customers. In different phrases, wi-fi technology permits users to connect to the In- ternet regardless of location.As a result, wireless technologies are rapidly turning into a regular a part of the communications get admission to infrastructure. Wireless LAN is one of the significant wireless access infrastructure in wi-fi technology because Wireless LANs provide a short and powerful extension of a wired network or fashionable LAN.By virtually putting in get entry to factors to the stressed out community, non-public computers and laptops prepared with wi-fi LAN playing cards can hook up with the wired network[2].

III. HANDOFF PROCESS:

A handoff in 802.11 is the technique that permits a wireless client (STA) to trade of get right of entry to factor (AP)[4].The handoff detection and selection process is supplier unique and isn't always certain by 802.11 requirements.

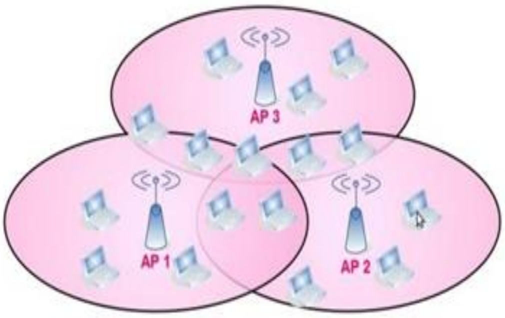


Fig. 1. Handoff

A. Types of WLAN networks

The fundamental service unit of 802.Eleven network is the Basic Service Set (BSS),this is surely a collection of STAs that com-municate with each distinctive.Communications take place within a some what fuzzy vicinity,known as the essential carrier region, described through the propagation characteristics of the wireless medium. When a STA is within the easy company region, it could communicate with the opposite members of the BSS.The BSS includes sorts of modes: the ad hoc mode and the infrastructure mode.

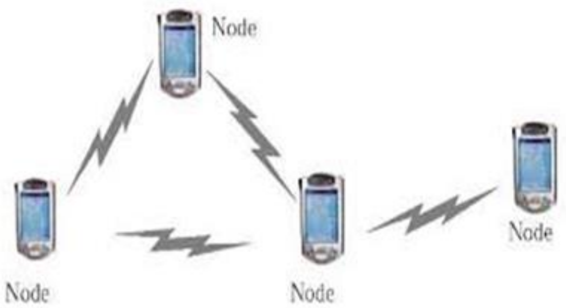


Fig. 2. Adhoc network

1) Adhoc WLAN:

Figure indicates the advert hoc mode network. As Shown in Figure2,STAs in an advert hoc network communicate without delay with every other and for this reason have to be within the identical communique variety. The smallest possible 802.Eleven community is an advert hoc network with two STAs. One commonplace use is to create a brief-lived network (e.G., for a single assembly in a conference room.)

Fig. 3. Adhoc network

2)InfrastructureWLAN:

As shown in figure3, Infrastructure networks[7] are distinguished by the use of an access point from the ad hoc networks.Access points are used for all communications in infrastructure networks, including communication between STAs and APs in the same service area.If one STA inAn infrastructure BSS want to communicate with any other STA inside the identical BSS,the communique need to take hops. First, the originating STA transfers the frame to the AP.Second, the get right of entry to factor transfers the body to the corresponded STA.In an infrastructure community, first of all the STA need to have an affiliation, that is the manner for joining in 802.11 network, with an AP to acquire network service.STAs always initiate the affiliation technique,and APs can also choose to accept or deny get entry to based totally at the contentions of an association request.

I.Arduino Agent

An intelligent agent(IA) is an autonomous entity which ob-serves and acts upon an environment(i.E. It's far an agent) and directs its activity toward attaining dreams(i.E.It's far ra- tional).Intelligent sellers may additionally analyze or use expertise to gain their dreams. They can be very simple or very complex: a reflex gadget inclusive of a thermostat is an smart agent as is a person, as is a network of people operating together closer to a goal.Stations which selects one-of-a-kind AP is an example for utlity based agent[10].

II.Fuzzy based implementation

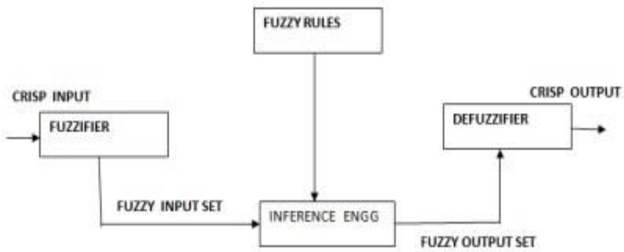


Fig. 4. Fuzzy Implementation

Fuzzy common sense[2] is a shape of many-valued logic; it offers with reasoning that is approximate rather than constant and precise. In comparison with conventional common sense theory, where binary units have two- valued good judgment: genuine or false, fuzzy common sense variables may additionally have a fact cost that degrees in degree between 0 and 1. Furthermore, when linguistic variables are used, these degrees may be managed by specific functions. The SNR(Signal to Noise Ratio) values are identified for the

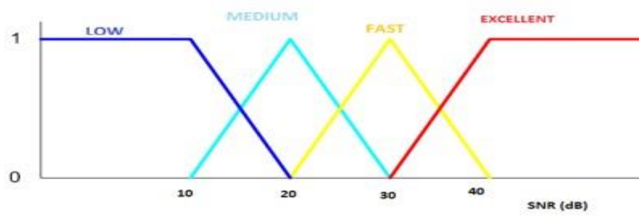


Fig. 5. Fuzzy Example

AP selection. If the SNR cost is greater than forty dB then the sign power is Excellent If the SNR cost is among 25 to 40 dB then the signal strength is Fast. If the SNR value is among 15 to 25 dB then the signal strength is Medium If the SNR value is among 10 to 15 dB then the sign strength is Slow If the SNR values is between 5 to 10 dB then No signal

Fuzzification: Using membership functions to graphically describe a situation as shown figure 6 is input membership function for SNR.

3)Rule evaluation(Application of fuzzy rules): The rules example are if SNR is low and Load is low then weak reject if SNR is medium and load is low then selectif SNR is high and load is low then select if SNR is low and load is medium then weak reject if SNR is medium and load is medium then select if SNR is high and load is medium then select if SNR is low load is high then then rejectif SNR is medium and load high weak reject if SNR is high and load is high weak reject.

IV. EXPERIMENTATION

NS2[9]is a object oriented network simulator for WLAN configurations. The simulation for 3 node with an Access Point is shown is figure 9

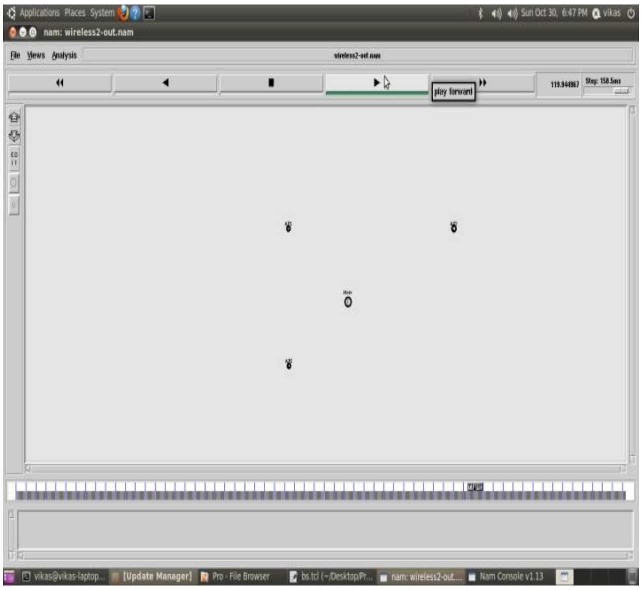


Fig. 9. AP Simulation

When undertaking the difficult task of designing a WLAN there are many elements that need to be taken into consideration, such as environment configuration, expected coverage, potential number of users, application types, site specific user demands, and co-channel interference. Therefore, the multitude of parameters that can influence the WLAN design requires close investigation. Irrespective of the optimization technique used it is essential to identify the critical factors that are required to gauge the quality of a potential solution. This section introduces the key elements that have been identified as the core inputs and constraints that an optimization technique relies on.

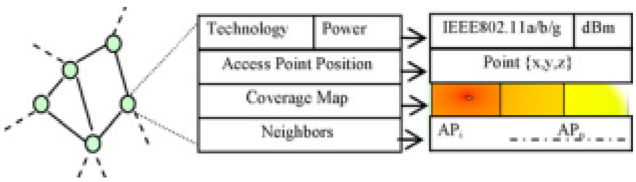
Environment Pre-Processing (Environment Database)
The most basic requirement needed in order to do any automatic design and optimization of a WLAN is the specification of where the WLAN should be deployed. The environment definition is essentially a skeleton description of a floor plan structure, which allows the designer to define it quickly with minimal effort. Hence, the building framework can be conveyed based on a combination of walls. The floor plan is used as an input for a propagation model that estimates the electromagnetic propagation throughout the environment, therefore walls with various materials that influence signal prediction need to be defined. To make it easier for the designer typical wall types can be defined and should be included as part of the environment database. Environment walls can be defined as, but not restricted to light wall, heavy wall, glass, or metal. A multistory building can be constructed by using a stacked approach, each floor plan that is defined as part of the building can be stacked to create a 2.5-D view of the environment. Fig. 1 represents a potential environment where the WLAN should be deployed.

User-Demand Specification
With the environment defined the next step is to specify additional constraints on the WLAN. It is essential that the designer can specify what performance is expected from the WLAN. It is these requirements that determine whether a suggested solution is valid or not. The most productive way to define these requirements is to group walls together to create potential target areas and allow the designer to explicitly specify user demands in those areas. The designer can also define restricted areas where it may not be desirable to have coverage, such as in hospitals where the network may cause interference with other devices, additionally due to environmental constraints it may not be possible to place access points in certain regions due to access or security issues, these restrictions should be defined during the user-demand specification phase.

The wireless network performance is heavily linked to the ability to support applications; therefore user throughput has a major impact in WLAN planning. In order to optimize the access point positions to cater for the class of users using the WLAN, the estimated usage requirements need to be defined by the designer. Therefore, each demand area has associated usage requirements including the number of users and the application requirements defined as throughput requirements. To help the designer three default user types are defined: low identifies users that have a low traffic content of 100 kb/user for web and email usage; medium suggests users who have a slightly higher requirement on the WLAN; and high indicates the running of all applications via WLAN requiring 300 kb/user. Although custom usage requirements can be defined for a specific design, this predefined user classification provides a reasonable guideline for designers.

Candidate Access Point Grid

To find a global optimal solution for the WLAN design problem all possible combinations of selected access points would have to be evaluated. The potential search space for such a problem is enormous and the required computational time for such an approach would be unacceptable, especially in large complex installations. Therefore, to reduce this search space and improve the speed of optimization convergence there is a need to generate a candidate access point grid. This access point grid represents possible physical positions throughout the environment where an access point can be placed. Approaches to the definition of potential access point sites include user defined, regular deployment where the design area is split into rectangles and access points are only placed in the center of these divisions, and a combination of a propagation simulator and regular grid is used. The number of potential installation sites has an impact on the quality of a solution and the complexity of the optimization; the selection of K access points out of a set of N possible sites is a combinatorial problem of N K . It may not be obvious especially in complex problems what size N should be, if N is too large the search space may be unnecessarily big and if it is too small there is a risk of missing an optimal solution. The complexity may lead a designer to reduce the size of N but as stated in a small N is equivalent to a sparse quantization of the continuous search space, which increases the probability that none of the quantized grid points are sufficiently close to the global optimum in the continuous search space.



Candidate access point structure.

It is not feasible to expect the designer to suggest all possible candidate positions especially in large environments. To automatically generate reference installation sites an algorithm that considers the geometry of the environment, previously defined demand areas that require coverage and the restricted areas where access points should not be placed is required. These criteria may not be captured by a regular deployment therefore an algorithm based on a growing neural-gas network proposed by Fritzke has been adopted to generate the grid. In this approach, a network topology is generated incrementally using competitive Hebbian learning (CHL) and a neural gas method.

The algorithm begins with two units and units are inserted successively during the self-organizing process. To determine where new units should be added local error measures, calculated as the squared distance between a unit and a randomly generated point within the environment, are generated during the adaptation process. A unit has a number of direct topological neighbors; a new unit is inserted between itself and the neighbor with the highest accumulated error. A detailed description of the algorithm can be found. The use of this algorithm allows for the generation and distribution of access points evenly in complex environments while maintaining desirable positions such as on walls and ceilings.

The structure of the nodes that make up the grid mesh is represented in Fig. 2. This shows that not only does a candidate access point has a physical position but it also has a defined transmit power, an associated coverage map generated using the appropriate propagation model and a list of neighbors, which when connected represent edges that can be traversed during the optimization process. The generation of this access point grid reduces the optimization search space and increases optimization speed as the generation of the coverage map is only done once before the optimization begins. The resulting information from the pre-processing remains static during the optimization process and is used as part of the optimization algorithm to evaluate the quality of a suggested solution.

The coverage map that is calculated is an integral element to the solution quality. To determine the most suitable propagation model for the purposes of optimization, a number of models were investigated. As a result of various measurement campaigns it was determined that the Motif Model was the most suitable for WLAN design. The Motif Model is more computationally demanding than empirical models but is much faster to compute than other ray-opticalbased models because it takes advantage of the simple linedrawing technique of dividing the environment description into a grid while retaining the accuracy of the ray-optical approach. The predicted signal coverage is also used to calculate the noise from surrounding access points. Noise at a point from a single interfering neighbor is calculated as the received signal level value from that neighbor access point, multiplied by the overlapping factor of the channel separation between access point and the neighbor access point. The total noise is calculated as a sum of this value for all neighboring access points. This intern is used to calculate signal-to-noise ratio (SNR) and hence predict achievable throughput. Each grid element of the coverage map resides within a predefined demand area; therefore each grid point has a required throughput inherited from the demand area set by the designer. It is assumed users are distributed evenly within the demand area.

The elements described above play a vital role in designing the agent-based optimization algorithm. In particular the candidate access point grid describes the environment the agent operates in. The following section describes the optimization framework used and how the problem constraints are mapped to the agent algorithm to automatically design a WLAN.

Optimization Framework

Task Environment

A task environment essentially describes the problem which a rational agent aims to solve. Although the range of task environments is vast and problem specific there are a number of properties that can be used to help determine the type of agent to design. The WLAN design task environment is fully observable; the agent can sense all information relating to its performance measure, meaning it has everything it needs to make a rational decision. The agent can sense its coverage cell, demand satisfaction, resource utilization, and SNR. The advantage of having an agent that is fully observable is such that an internal state to keep track of the world is not necessary. From the agents point of view the task environment is strategic, it can determine the state of the environment based on its current percepts and the action taken by the agent. The only element of the environment state the agent cannot determine is the actions of other agents on the environment. The task environment can also be described as being episodic. Each episode does not depend on the actions taken in previous episodes; the agent calculates its utility in each episode based only on those percepts in the current state. The choice of action in each episode depends only on the current environment state. As the environment does not change as the agent makes a decision it can be described as being static. There are also a discrete set of precepts and actions within the environment.

These properties of the task environment support the design of agents; the WLAN problem is a partially cooperative multiagent environment. Agents are deemed cooperative as the actions of an agent can influence neighboring agents (noise). Therefore to solve the design problem the agents are required to work together to maximize their utility without having an adverse affect on other agents.

After defining the task environment the next step is to model the optimization problem as an agent playing in a game. The outcome of this game should be a solution that maximizes user demands with a minimum number of access points. Fig. shows the architecture of the environment for WLAN design.

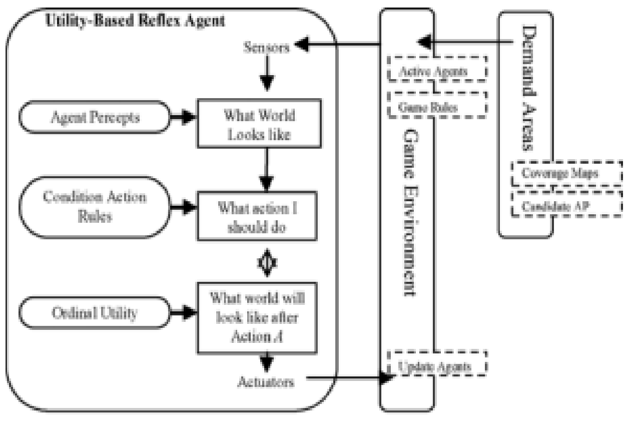


Fig. Agent design and game environment.

The game environment consists of current active agents in the game, the results of pre-processing such as the candidate access point grid, coverage maps, and demand areas. Also included in the game environment are any additional rules that agents must adhere to while playing the game such as the premise that stipulates an agent can only move across the edges of candidate access point grid. The most crucial part of the environment description is the agent design; the following section defines what an agent is and describes the format of the agent for WLAN design.

Agent Design

An agent is an entity that can act based on its perceived view of the environment in which it exists. Once the task environment has been clearly defined, it is required to identify the actions taken in response to any percept sequence; this is known as the agent function.

An agent program must be designed to execute the defined function within the described environment. For WLAN planning, a simple utility-based reflex agent was selected. This type of agent has a more general performance metric than just achieving a goal or not, this allows the agent measure its level of "usefulness" or success if an action is chosen and is also governed by a set of simple rules. As we aim to model agent behavior and require a global solution to emerge from local decisions a utility-based reflex agent is the most suited design for WLAN optimization. For the purposes of WLAN design, we have designed a utility-based reflex agent as shown in Fig. 3, in general this agent has a goal of maximizing its resource utilization. To achieve this goal the agent must make rational decisions that lead to improved performance. This implies that an agent must know what the world looks like, know what actions it can take and be able to evaluate the success of taking such an action, the components that allow an agent do this include agent precepts, a utility function and agent condition-action rules.

V. CONCLUSION AND FUTURE WORK

The AP choice is critical in utility in which WLAN is shared by big range of cell nodes.Selection technique used in 802.Eleven which remember SNR executed can be improved used multi item and multi agent approch.Fuzzy primarily based de- cision making improves the device as professional knowlege is incorprated in control.Hence the device improves to the following degree of intelligence.Use of type2 fuzzy[10] in selection making which could hadlle second order uncertainity.Type-2 fuzzy sets and systems generalize (kind-1) fuzzy units and structures so that more uncertainty can be treated.From the very beginning of fuzzy sets, complaint turned into made approximately the truth that the membership feature of a type-1 fuzzy set has no uncertainty associated with it,something that seems to contradict the word fuzzy,since that word has the connotation of lots of uncertainty.So, what does one do when there is uncertainty about the value of the membership function using type-2 fuzzy set.

REFERENCES

[1] Murad Abusubaih, Sven Wiethoelter, James Gross, Adam Wolisz, Inter- national Journal of Parallel, Emergent and Distributed Systems,"A new access point selection policy for multi- rate IEEE 802.11 WLANS" (Aug 2008).

[2] T.J.Ross,Fuzzy Logic with Engineering Applications, McGraw-Hill, (1995)

[3] G. Holland, N. Vaidya, and P. Bahl,A Rate-Adaptive MAC Protocol for Multi-Hop Wireless Networks, in Proc. of ACM/IEEE Mobicom, (July 2001).

[4] M. Heusse, F. Rousseau, G. Berge-Dabbatel, and A. Duda,Performance Anomaly of 802.11b, in Proc. of IEEE Infocom, (March 2003).

[5] A. Kumar and V. Kumar, Optimal Association of Stations and APs in an IEEE 802.11 WLAN,in Proc. of Nat. Conf. on Communications (NCC), (February 2005).

[6] M.Abusubaih, J. Gross, S. Wiethoelter, and A.Wolisz, On Access Point Selection in IEEE 802.11

[7] Anthony J. Nicholson, Yatin Chawathe, Mike Y. Chen, Brian D. Noble, and David Wetherall,Improved Access Point Selection, In Proceedings of MobiSys, June,(2006).

[8] EE Std. 802.11-2007, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specications, IEEE Std. 802.11, 2007 edition.

[9] Poornaselvan, K.J. Kumar, T.G. Vijayan, V.P.Dept. of EEE, Gov. Coll. of Technol.,Coimbatore ,Agent Based Ground Flight Control Using Type- 2 Fuzzy Logic and Hybrid Ant Colony Optimization to a Dynamic Environment Emerging Trends in Engineering and Technology, ICETET 2008.

AUTHORS PROFILE

Mr. Vinodh P Vijayan, Head of Department, Computer Science, Mangalam College of Engineering, Kottayam, India has completed Bachelors Degree in Electronics and Communication Engineering, Post graduation in Computer Science Engineering His area of interest includes Soft Computing, Robotics, Bio-inspired computing, Fuzzy systems.

Ms.Neema George working as an Assistant Professor in Mangalam College of Engg,Kottayam,Kerala.Masterof Engineering in Computer science and Engineering (M.E CSE) from:Anna University Chennai.Bachelor of Technology in Computer Science and Engineering (B.Tech-CSE) from MG University, kerala.Her Area of interest Cloud Computing,Machine learning,Artificial intelligence .

Ms.Simy Mary Kurian working as an Assistant Professor in Mangalam College of Engg,Kottayam,Kerala.Masterof Engineering in Computer science and Engineering (M.E CSE) from:Karunya University Chennai.Bachelor of Technology in Computer Science and Engineering (B.Tech-CSE) from MG University, kerala.Her Area of interest Image Processing,Machine learning,Artificial intelligence .

Ms.Sujitha M working as an Assistant Professor in Mangalam College of Engg,Kottayam,Kerala.Master of Technology in Computer science and Engineering (M.Tech CSE) from:Anna University Chennai.Bachelor of Technology in Computer Science and Engineering (B.Tech-CSE) from MG University, kerala.Her Area of interest Data Analysis,Image Processing,Artificial intelligence .