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Vertical Handoff Technique between Wifi and Wimax using Fuzzy Comprehensive

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ABSTRACT

This paper describes the new vertical handoff technique for integration of Wifi (IEEE802.11) and WiMAX (IEEE802.1M6) wireless network based on fuzzy comprehensive. The fuzzy comprehensive theory considers various factors like signal to noise ratio, signal strength and terminal moving speed. Simulations of these factors are performed in Network Simulator (NS2, NS3). The result of the experiment will increase the connectivity strength and reduce the ping pong effect.

Keywords- wifi; wimax; fuzzy comprehensive; vertical handoff technique

I.Introduction

At the present time, various cities are developing wireless network communication to make "Wireless City", this can be achieve by integrating Wifi and WiMAX wireless heterogeneous networks and expect to achieve the ubiquitous wireless communication environment. So when a user in both environment then, problem of vertical hand will create. This paper provides the techniques which can be reduce the hand off connectivity loss and show the excellent performance. Institute of Electrical and Electronic Engineer formulated by the IEEE 802.11 standard in 1997. The main development of the use of radio technology, you can structure a limited area network, the same function. Wifi (IEEE802.11) wireless network features in flexibility, high-bandwidth as well as small coverage area. Generally Wifi wireless communication is used to cover "thirty meter range" which is suitable for home and office use, it is rather simple way. IEEE 802.16 Working Group in order to be able to use the microwave frequency bands for wireless broadband transmission technology

standardization, and developed a prototype WiMAX. That by the year in December 2005, set the IEEE 802.16e also known as Mobile WiMAX 802.16e standard is an enhanced version of the S02.16-2004 standard [9] supports both fixed and mobile wireless users, offering a high-speed mobile data services, can be seen as the only capable of 3G (third-generation mobile communications) pose competition to the next generation of broadband wireless technologies. The WiMAX Combined with Wi-Fi and 3Gwireless Internet technology will be the future trend.[6][5] The farthest transmission distance of its wireless signal is 50 kilometres, which is 10 times of 3G (3rd-generation) base station. It also could cover the range of 1.6 kilometres in radius. WIMAX's transmission rate is up to 74.81Mb/s and able to offer QoS performance data, video and audio services. [1]

II. Vertical Handoff in WirelessHeterogenous

There are three phase in vertical handoff in wireless heterogeneous:

1. Launching phase, knowing which networks are reachable;
2. Decision phase, evaluating the reachable networks according to certain criterion and selecting the best target network;
3. Implementing phase, finishing the detailed switching work after judgment. Based on the periodic measurement results, users in the network determine whether it is needed to switch to the target networks as well as to which network. The judging standards depends on quality requirements of users service or network parameters. Vertical handoff faces enormous challenges in terms of switching performance, handoff judgment, interactive operation control and others. Current researches have obvious shortcomings [3]. First, optimization of switching performance. Vertical handoff has to ensure the independence of the underlying access technology and performs at the high-level while the versatility of this results in the loss of performance. Second, lack of efficient, practicable decision methods. Vertical handoff judgment is a typical multi-criteria judging problem. Poor feasibility and failure in full use of network resources, significant "pingpong" effect and other demerit are shown in the current studies.

The researches concerned with vertical handoff basically could be divided into three categories:

2.1. Decision Strategy based on Signal Strength

Some signal strength is regarded as threshold value. Access or exit according to signal strength received higher or lower the threshold value [3].

2.2. Decision Method on the basis of Mobile Terminal

This approach takes signal strength and network availability into consideration and combines judgment factors such as service types, access expenditures, user

preferences, power consumption as well as available broadband to calculate and assess the optimal access network through constructing cost function[4][5].

2.3. Decision Method based on Artificial Intelligence or Fuzzy

Logic Design of multidimensional judgment strategies in view of artificial intelligence or fuzzy logic and combination of several network parameters [6][7]. Self- adaptation vertical handoff algorithm is proposed to precisely determine the switch to the target network in a heterogeneous network environment on the basis of researches with regard to fuzzy inference system and modified neuron network. Vertical handoff decision of heterogeneous network is a comprehensive decision problem involving several factors [8], such as conditions and characteristics of current available network, business features and demands, terminal specialties and preference, terminal moving speed and target network service. All these factors should be synthesized to determine. Fuzzy control is a decision-making method based on incomplete information and uncertainty in an area. Incorporation multi-factor handoff decision mechanism with fuzzy logic lies in fuzzy property of radio. Fuzzy logic itself is employed to solve the inaccuracy of parameters. A new vertical handoff algorithm is proposed in this paper for the integration of heterogeneous network, which is based on fuzzy comprehensive evaluation, considers the factors of various categories in wireless heterogeneous network, compares the quality between target network and current network to user terminal, and selects optimal switching moment and target network. It takes WiMAX and WiFi networks as example to complete simulation experiment in NS2 simulation environment.

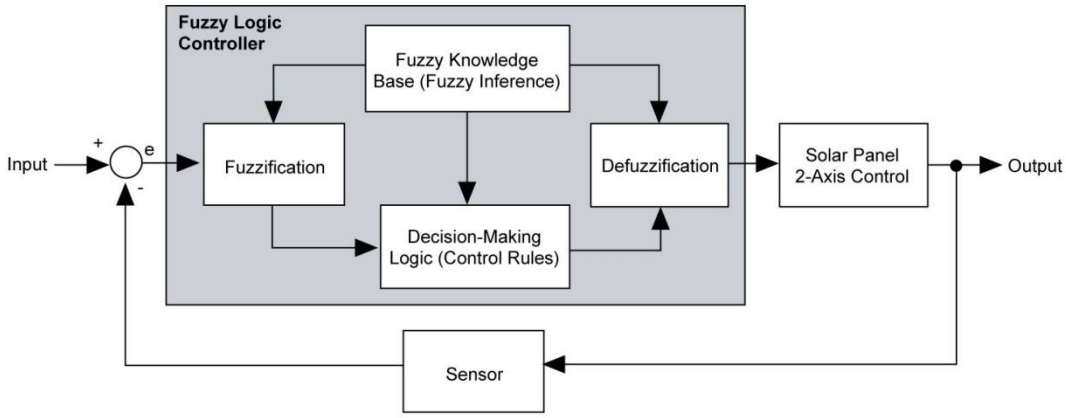
III. Decision Based on Fuzzy Comprehensive

There is no need for fuzzy control to comprehend the accurate mathematical model, control regulations and adopted language variables expression of known controlled objects. It is also provided with the characteristics like easy to implement and real-time control. Fuzzy control has been successfully applied to linearity, non-stationary and self- adapting system controls.

IV. Fuzzy Control System

A fuzzy control system is a control system based on fuzzy logic—a mathematical system that analyses analog input values in terms of logical variables that take on continuous values between 0 and 1, in contrast to classical or digital logic, which operates on discrete values of either 1 or 0 (true or false, respectively).

Fuzzy control system consists of four parts: fuzzification, fuzzy rule base, fuzzy inference and defuzzification [9]. Thelogic diagram is shown in figure 1:



Input language information is fuzzificated in the membership function by fuzzy control. Fuzzy relations are thecorresponding relations of input fuzzy set I and output fuzzy O. All relations between I and O constitute the rule base, which determines the relationship between input and output fuzzy sets. According to the relations in the rule base, fuzzy inference matches the value after fuzzification to find the corresponding output information. Contrary to fuzzification function, defuzzification function is to convert fuzzy set to a clear action.

V. Wi-Fi

A wireless network uses radio waves, just like cell phones, televisions and radios do. In fact, communication across a wireless network is a lot like two-way radio communication. Here's what happens: A computer's wireless adapter translates data into a radio signal and transmits it using an antenna. A wireless router receives the signal and decodes it. The router sends the information to the Internet using a physical, wired Ethernet connection. The process also works in reverse, with the router receiving information from the Internet, translating it into a radio signal and sending it to the computer's wireless adapter.

The radios used for WiFi communication are very similar to the radios used for walkie-talkies, cell phones and other devices. They can transmit and receive radio waves, and they can convert 1s and 0s into radio waves and convert the radio waves back into 1s and 0s. But WiFi radios have a few notable differences from other radios:

They transmit at frequencies of 2.4 GHz or 5 GHz. This frequency is considerably higher than the frequencies used for cell phones, walkie-talkies and televisions. The higher frequency allows the signal to carry more data.

They use 802.11 networking standards, which come in several flavors:

- 802.11a transmits at 5 GHz and can move up to 54 megabits of data per second. It also uses orthogonal frequency-division multiplexing (OFDM), a more efficient coding technique that splits that radio signal into several sub-signals before they reach a receiver.
- 802.11b is the slowest and least expensive standard. For a while, its cost made it popular, but now it's becoming less common as faster standards become less

expensive. 802.11b transmits in the 2.4 GHz frequency band of the radio spectrum.

- 802.11g transmits at 2.4 GHz like 802.11b, but it's a lot faster -- it can handle up to 54 megabits of data per second. 802.11g is faster because it uses the same OFDM coding as 802.11a.
- 802.11n is the most widely available of the standards and is backward compatible with a, b and g. It significantly improved speed and range over its predecessors.
- 802.11ac is the newest standard as of early 2013. It has yet to be widely adopted, and is still in draft form at the Institute of Electrical and Electronics Engineers (IEEE), but devices that support it are already on the market.

VI. WiMAX

WiMAX (Worldwide Interoperability for Microwave Access) is a wireless communications standard designed to provide 30 to 40 megabit-per-second data rates, [7] with the 2011 update providing up to 1 Gbit/s[citation needed] for fixed stations. The name "WiMAX" was created by the WiMAX Forum, which was formed in June 2001 to promote conformity and interoperability of the standard. The forum describes WiMAX as "a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL".[3]

VII. Which one is better WiMAX or Wi-Fi?

Although not being targeted on the same use, more recently WiMAX technology has several advantages compared to Wi-Fi. Such as: a better reflection tolerance; a better penetration of obstacles; and an increased in the number of interconnections.It is obvious that the WiMAX standard goal is not to replace Wi-Fi in its applications but rather to supplement it in order to form a wireless network web. Despite the similarity in equipment cost, WiMAX technology requires a costly infrastructure in contrast to Wi -Fi which can easily be installedusing low cost access points [7].

VIII. Conclusion

This paper has presented a precise description of two of the most prominent developing wireless access networks and even discussed the method by which these technologies may collaborate together to form an alternatives for implementing last - mile wireless broadband services.Heterogeneous network handoff is a multi-factor decision-making matter. This paper proposes a new techniques basedon fuzzy comprehensive evaluation, utilizes the signal strength, signal noise ratio and speed of mobile terminal for vertical handoff. Compared with single factor handoff decision algorithm in simulation environment, the new algorithm triggers and switches more accurately, decreasesswitching quantities with high efficiency, reduces "ping-pong" effect, showing outstanding performance in stability. More network parameters will be considered as handoff decision factors to examine handoff performance such as bit error rate and available bandwidth in the coming experiment.

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