Handoff Scheme for Terrestrial Mobile and Satellite Convergence Networks with Incorporation of Pattern Recognition Algorithm

Kwong Chiew Foong[a]

[a]*Faculty of Engineering and Technology*
INTI University College, 71800 Nilai, Negeri Sembilan, Malaysia
E-mail : kwong@intimal.edu.my

ABSTRACT

As the communication becomes a global affair today, engineers had begin to look into the heterogeneous network solution for faster and cheaper deployment. For heterogeneous network to function properly, efficient and effective mobility management is vital to ensure uninterruptable and ubiquitous connection. Recently there has been many works done to replace the traditional handoff decision algorithm such as hysteresis and fuzzy logic based handoff algorithm, especially in the heterogeneous environment. The fuzzy handoff algorithm proposed by earlier work is not optimized and required constant attention from the human experts. This paper proposes a newer approach using Adaptive Network Fuzzy Inference System (ANFIS) where the training element is incorporated into the existing fuzzy handoff algorithm. This paper also discusses the effective mobility management strategy to suit the hybrid terrestrial and satellite segment.

Keywords

Heterogeneous Network, ANFIS, Fuzzy Handoff, Mobility Management

1.0 INTRODUCTION

Whilst today's terrestrial communication system has been very well established, there is still a great deal of territory that has no satisfactory coverage. To fulfill the aspiration of a truly global coverage communication, the connectivity of anyplace, anytime and anyone has to be satisfied. However, the problem lies on the existing backbone where it cannot be extended into the area where the communication tower cannot be economically built. The obstacles in terms of terrain and vegetation have posed a great challenge for engineers to fulfill the global communication aspiration. The use of satellite technology to complement the existing terrestrial networks is seen to be an excellent choice to narrow the gap of the "dark" spot of the wireless network coverage. Taking advantage of its global nature, satellites can cover a large area, even into the places where the terrestrial coverage is almost considered impossible.

The idea of converging satellite and terrestrial hybrid network is not new and many notable research projects especially in Europe have been investigating its practicality and usability. For instance the ACT Satellite Integration into Networks for UMTS Services (SINUS) project looked into the possibility of integrating Space-segment UMTS (S-UMTS). (Priscoli, 1999) The Multi-segment System for Broadband Ubiquitous Access to Internet Services and Demonstrator (SUITED) project funded by the European Union under the IST Program had looked into the performance of hybrid networks especially in the heterogeneous environment (P. Conforto et. al., 2002).

For a hybrid networks to function without any significant interruption, several issues on mobility management needs to be addressed. The different requirements and expectation of space and terrestrial segment for instance has made the handoff decision task to be more challenging while the existing handoff decision algorithm is not suitable in the heterogeneous networks.

In this paper we propose some mobility management strategies to support efficient handoff in the heterogeneous networks. We also propose a rather new handoff decision algorithm incorporating optimsation method such as fuzzy logic and hybrid algorithm, i.e. the Adaptive Neuro Fuzzy Inference System (ANFIS).

2.0 MOBILITY MANAGEMENT STRATEGY

2.1 Connection Transference Scheme

Traditionally, handoff connection transference scheme rely heavily on hard handoff, and usually a preferred scheme due to its simplistic nature. In hard handoff scheme, the connection is usually severed first before establishing into a new base station. This however is not suitable for hybrid satellite and mobile scenario due to the longer propagation delay.

Another type of connection transference scheme is the soft handoff scheme, where the transference of the network bearer from old base station to the new base station is done