Chapter 47
Hierarchal Fuzzy Logic Controller and Internet of Things (IoT) Information: Disease Spreading as a Test Case

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ABSTRACT

With the advances of networks and sensing technologies, it is possible to benefit from the surrounding environment's data in enhancing peoples' life. Currently, we have different types of networks such as Wireless Sensor Networks (WSNs), Vehicle Ad Hoc Networks (VANETs), Cellular Networks (CNs), and Social Networks (SNs) along with underlying computing such as Cloud computing. These types of networks provide huge data about the surrounding environments including weather information, peoples' relations, peoples' interest, and location information. This paper examines the suitability of hierarchal fuzzy logic controller in classifying the IoT data. The paper also tries to answer "if-else "questions about the effect of each of the input parameters. The authors' test case in this paper is related to the disease spreading prediction problem. This test case is highly important to the health care organizations. Different case studies are generated to examine the efficiency of the proposed framework and methodologies.

1. INTRODUCTION

With the advances in networking, Internet of Things (IoT) networks are excellent sources of data especially environmental data. Some of these networks are the Vehicular Ad Hoc Networks (VANETs), Wireless Sensor Networks (WSNs), Cellular Networks, and Social Networks. Each of these networks has its own addressing and protocols including routing and MAC protocols. At the same time, each of these networks has its own architecture; some of them are fixed topology and some others might be dynamic. Moreover,

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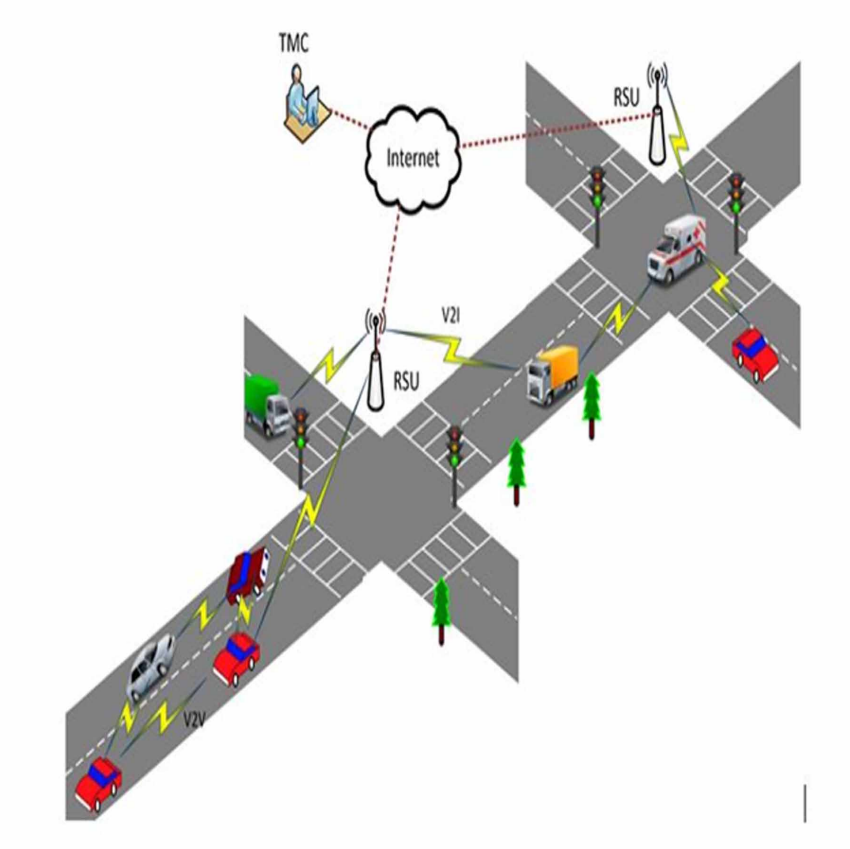
Figure 1. VANET reporting style



some of them are mobile and some others are stationary. For instance, as shown in Figure 1, VANETs report their data through Road-Side Units while WSNs, as shown in Figure 2, report their data through one or more Sink node. On the other hand, Cellular networks work through Base Station Transceivers (BSTs) that receives the mobile data and sends it to a base station where servers can analyze such data. Nevertheless, some of these networks are mature enough in terms of the used protocols such as Cellular networks, as shown in Figure 3, with their generations and some others are still working with de facto standard protocols such as VANETs and WSNs.

2. PROBLEM STATEMENT

With the IoT huge data that needs to be analyzed and classified. Regular fuzzy logic techniques are not able to classify such huge data, especially with many parameters are ejected. Therefore, there is a need for a new controller that handles many of the parameters coming out of the IoT networks. Therefore, this paper is a step forward towards developing a complete framework that can be efficiently used for IoT network such as networks such as VANET, cellular networks, social networks, and WSNs. The new framework also tries to answer “if-else “questions about the effect of each of the input parameters. In