Resource Allocation In Internet Of Things Using Fuzzy Logic

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***Abstract*- Requirement of higher bandwidth and stringent delay constraint in multiuser wireless video transmission application, all video senders must have enough transmission opportunities before their deadline expire is a key issue in Internet of things enabled networks. Thus fuzzy based delay aware resource allocation (DARA-F) algorithm is proposed in this paper which solves the problem without assuming detail packet level knowledge. Instead, we convert the transmission delay deadlines of each sender's video packets into linearly decreasing weight distribution within the considered time horizon by using predefined fuzzy rules. A unique characteristic of the DARA-F algorithm is a non-stationary slot allocation method that depends on the allocation of previous slots. This is different from all existing slot allocation policies such as round-robin or rate-adaptive round-robin policies, which are stationary because the allocation of the current slot does not depend on the allocation of previous slots.**

***Index Terms* - fuzzy logic, Internet of Things, non-stationary, resource allocation.**

I. INTRODUCTION

The IoT refers to uniquely addressable objects and their virtual representation in internet like structure. Such objects may link to information about them, or may transmit real-time sensor data about their state or other useful properties associated with the objects [1]. Multi-user wireless resource allocation for multiple video transmitter is a longstanding research problem [2].The crucial issue IoT enabled network is how to allocate the timeslots to the sensors such that all sensors send sufficient amount of packet before their deadline expires to get good quality video at receiver side [3].. The existing video streaming solutions such as single video streaming which assumes exact packet level knowledge [2], NUM algorithm is studied for wireless resource allocation for multiple users but the resource allocation is stationary. In MUMDP algorithm detailed packet knowledge and distortion impact is required for resource allocation. So these solutions are not suitable for IoT enable network where detailed packet knowledge is unavailable or a very complex process to obtain at real time. In R-round robin policy the packet level knowledge is not required but allocation is stationary because allocation of current time slot does not depend on allocation of previous time slot. Thus we proposed DARA-F algorithm which allocates the time slot to the sensor without having detailed priory knowledge of video packet and allocation is non-stationary which shows significant improvement in the performance.

II. PROPOSED SYSTEM

The block diagram of the proposed system is shown in fig 2.1. Where LPBR (low power border router)and fuzzy controller co-ordinates the time slot allocated to each sensor and aggregates the data from all sensors and forward them to the destination .Fig 2.2 shows work flow of proposed system

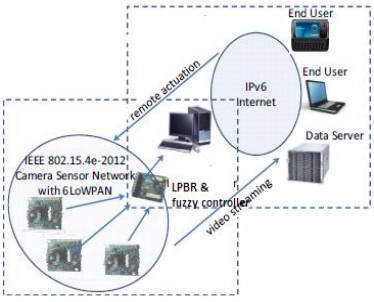

Fig. 2.1 video streaming over IoT oriented netwotk

2.1 Time slot allocation:

The importance of timeslots is highly related to their position - the earlier the slot is available to a sensor, it is more useful for its packet transmission since it provides more relaxation for the deadline requirement. Weights are assigned to slots for each sensor, which indicates the sensors' value of future transmission opportunities. These weights depends on only some statistical information of the sensors' such as content of video, video application requirements and encoding/ decoding techniques of video but not the specific packet-level information.

2.2 Fuzzy logic:

In 1965, fuzzy logic is introduced by Lotfi A.Zadeh, It is a form of reasoning, obtained from fuzzy set theory. The fuzzy logic variables have a truth value that ranges between 0 (False) and 1(True) [4]. Linguistic variables are the input and output variables of the system that is decomposed into a set of linguistic terms. Fuzzy inference is the process of formulating the mapping forms a given input to an output using fuzzy logic. Fuzzy logic has been applied in control system either to improve performance or to avoid difficult mathematical problems. Fig. 3 shows the three major processes of fuzzy inference system. There are three major processes in the fuzzy logic system includes fuzzification, Fuzzy inference and defuzzification.

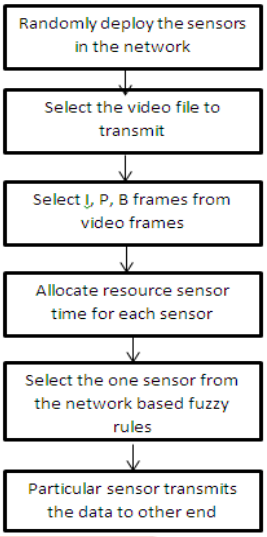

Fig.2.2 Work flow of proposed work

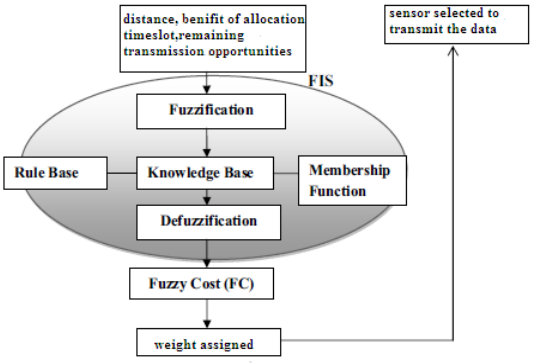

Fig 2.3 Selection of sensor to transmit the data

2.3 DARA-F algorithm

The DARA-F algorithm assign each sensor with a single index using fuzzy logic that takes into account three important aspects for allocation of time slot

(i)Distance from the target timeslot allocation
(ii)Benefit of allocating a timeslot to a sensor
(iii)Discounted sum of remaining transmission opportunities

For a sensor in the same slot frame. Current time slot is allocated to the sensor with the largest current index and then updates each sensor's slot indices. Hence, a sensor with:

(i)Larger distance from the target
(ii)Larger current benefit and
(iii)Fewer discounted remaining transmission opportunities

is more likely to be assigned with the current timeslot. DARA-F approach comprises of two steps . The first step is to determine weighted sum rate allocation using deadline distribution and expected video quality. And second step comprises of slot allocation s using algorithm in order to achieve the rate allocation r.

III. RESULTS

In this system fuzzy membership functions are designed and performance of sensors are plotted as PSNR(in db) versus sensor index. The algorithm is simulated using MATLAB software. The output results are as follows:

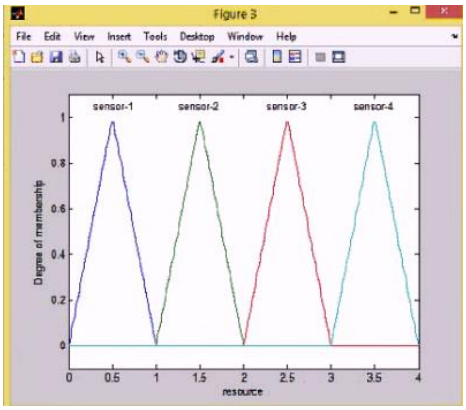

Fig. 3.1 membership function

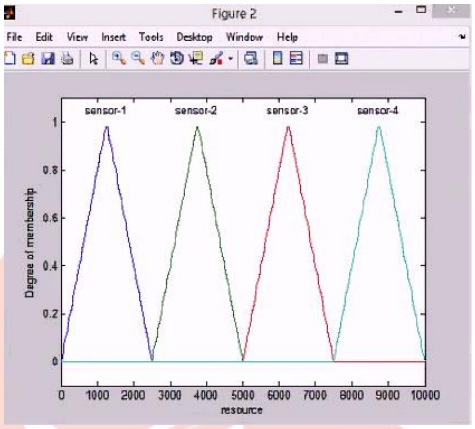

Fig 3.2 membership function

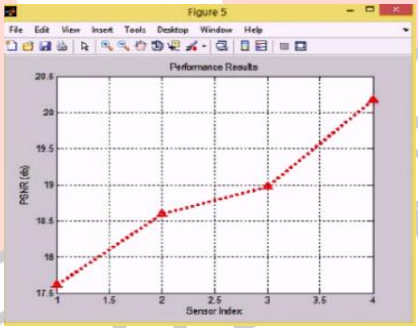

Fig 3.3 Performance in PSNR(db) Vs. sensor index

IV. CONCLUSION

We present a new solution for time slot allocation of multi camera video streaming under the Internet-of-Things (IoT) paradigm. Our numerical studies and simulation using MATLAB shows significant performance improvements.
against existing solutions. The present algorithm is constructed to operate in a particular setting but it can be applicable to many other resource allocation problems in many other settings.

V. REFERNCES

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