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F-DARAAlgorithm forTime Slot Allocation in Internet of Things

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***Abstract*- In multi-user wireless video transmission over Internet of Things, to ensure that all video senders have sufficient transmission opportunity before their deadline expire is a challenging and key issue. Thus fuzzy based delay aware resource allocation (F-DARA) algorithm is proposed in this paper. This algorithm solves the problem without assuming detail packet level knowledge. Instead, transmission delay deadlines of each sender's video packets are converted into linearly decreasing weight distribution within the considered time period. Non-stationary slot allocation method is a unique characteristic of F-DARA algorithm which 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.**

***Keywords*- F-DARA, fuzzy, Internet of Things, non-stationary, resource allocation**

I. INTRODUCTION

Ubiquitous sensing enabled by Wireless Sensor Network(WSN) technologies cuts across many areas of modern day living. This offers the ability to measurer, infer and understand environmental indicators from delicate ecologies and natural resources to urban environment. The proliferation of these devices in communicating actuating network creates the Internet of Things (IoT).[6]In multi-user wireless video transmission over Internet of Things, to ensure that all video senders have sufficient transmission opportunity before their deadline expire is a challenging and key issueSuch 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 F-DARA algorithm in this paper which solves the problem without assuming detailed packet level knowledge. This slot allocation method is stationary slot allocation method which is completely different from all existing slot allocation methods such rate adaptive robin robin policies. The slot allocation process is stationary if each slot assignment depends only on the available set of selection states and the user preference and does not depend on time. Otherwise, a slot allocation is non-stationary.

II. PROPOSED SYSTEM

The block diagram of the proposed system is shown in Fig. 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 shows work flow of proposed system

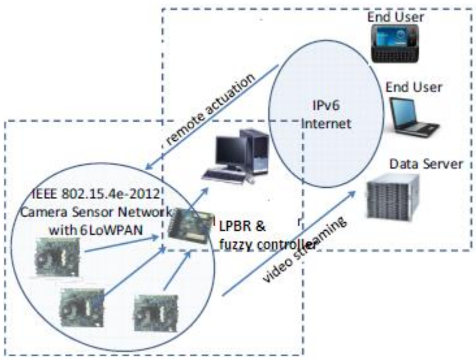

Fig. 1.video streaming over IoT oriented netwotk

A) *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.

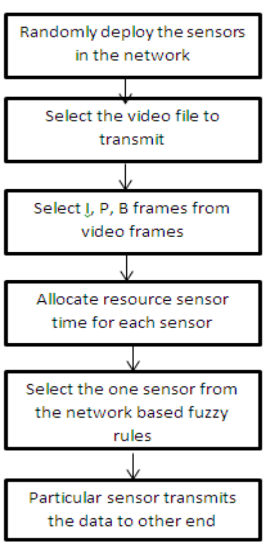

Fig. 2. Work flow of proposed work

B) *Fuzzy logic*

In the fuzzification step, fuzzy parameter values are converted into linguistic values. Each fuzzy set is associated with a membership function used to characterize how certain the crisp input belongs to the set. For a given crisp input, the membership function returns a real number in the range [0,1]. The closer the membership value is to 1, the more certain the input belongs to the set. Fuzzy inputs considered in the proposed work are distance from target, benefit of allocating current timeslot and discounted sum of remaining transmission opportunities.. A single crisp value can take more than one linguistic value if the membership values overlap. In the inference step, a set of rules called rule-base, which emulates the decision-making process of a human expert is applied to the linguistic values of the inputs to infer the output sets which represents the actual control signal for the process.

In fuzzy logic, an element {a} can have a degree of membership in a fuzzy set X, where U →[0,1] is the universe of discourse, a € U, where μ(a) is a membership function. A membership function associated with a fuzzy st maps an input value to an appropriate membership value. This mapping is known as fuzzification.

C) *Fuzzification*

Fuzzy based time slot scheme considers three parameters for fuzzification:

1. distance from target
2. benefit of allocating current timeslot and
3. discounted sum of remaining transmission opportunities. The output of linguistic parameters is the time slot allocation for a sensor in a given application.

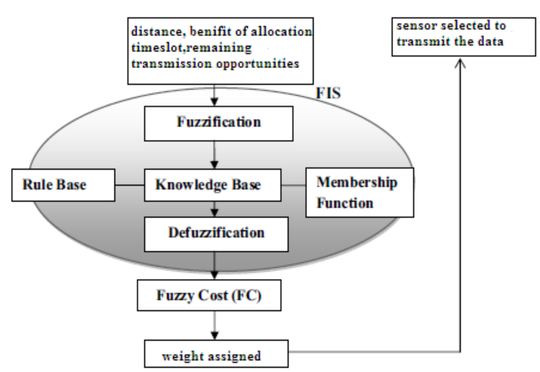

Fig. 3. Selection of sensor to transmit the data

D) *F-DARA algorithm*

The F-DARA 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. F- DARA 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.

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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 membership function for input parameters and the output results are as follows:

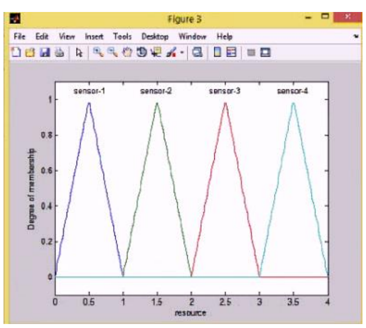

Fig. 4.Membership Function

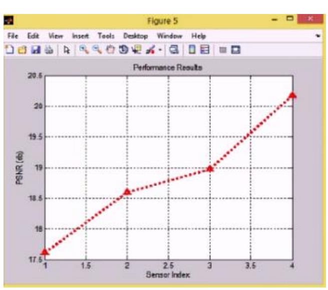

Fig. 5.Membership Function

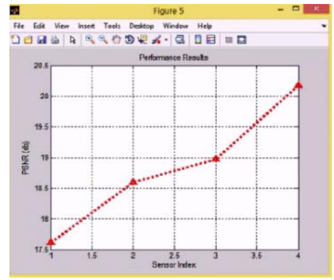

Fig. 6.Membership Function

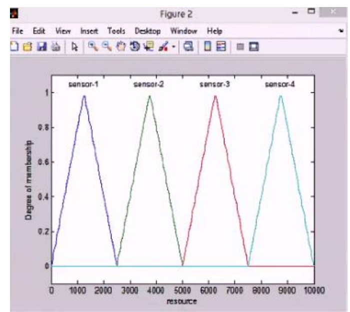

Fig. 7.Membership Function

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.

References

[1] Jayavardhana Gubbi, Rajkumar Buyya, Slaven Marusic, MMarimuthu Palaniswami ,"Internet of Things(IoT): A vision , Architecture Elements, and future Directions.

[2] Janaki Bandara, Xuemin Shen and Zafrin Nurmohamed, "Fuzzy resource controller for non-real time traffic in wireless Networks"IEEE 2000.

[3] Jie Xu, Yuanzhang Xiao, "Non –Stationary resource allocation policies for delay-constrained video streaming:Application to video over Internet-of-Things- Enabled network," IEEE journal on selected areas in communication,vol 32, No.4, April 2014

[4] T.Watteyne et al."Open WSN:a standards-based low-power wireless development environment"Europ. Trans. Emerg. Telecom. Technol.,vol. 23, no.5,pp. 480-493 2013

[5] Dr.K.Thangadurai, C.V.Anchugam "Fuzzy Cost Based Multipath Routing Protocol for MANETS," World Congress on Computing and Communication Technologies2014 IEEE

[6] Tzung-Pei Hong"**, Chai-Ying Leeb, "Induction of fuzzy rules and membership functionsfrom training examples'," Fuzzy Sets and Systems 84 Elsevier Science B.V. 1996