Semiconductor Optoelectronics, *Vol. 41 No. 12 (2022), 1269-1276*
https://bdtgd.cn/

CLOCK SYNCHRONIZATION WITH PI METHOD USING CRISTIAN'S ALGORITHM

Mrs.G.Saraniya[1] , Dr.C.Yamini[2]
[1]Research Scholor, [2]Associate Professor
Department of Computer Science
Sri Ramakrishna College of Arts and Science

Abstract
Synchronization of time is crucial thing with significant component in wireless sensor network (WSN) to maintain the synchronization using different nodes. Sensor networks have some unique characters which makes difficult for applying the traditional network clock approaches. This paper is about the implementation clock synchronization with Hybrid common multiple model to apply on the Least Common Multiple factors which will helps to neglect the offset of clock and skewness of the clock rate from sensor nodes. This Proposed implementation is used for activating the node to perform synchronization of nodes timely for calculating the Least common multiple of each and every clock time period in a network. Network will form the cluster group with each and every node in a network to synchronize the network on time using clock time period. The proposed Cristian algorithms with Proportional Integral method which process to synchronize the time-to-time server which are efficient in model. This Model is based on Weight based instead of Energy based Model with the parameters such as accuracy, overhead of communication and computation values.
Keywords: Clock synchronization; Wireless Sensor Network (WSN); clock time period ; Hybrid common multiple; Cristian algorithm.

I INTRODUCTION

Wireless sensor network is the significant component of time synchronization to maintain the synchrony among the nodes and these protocols are utilize the dedication of synchronization packets for clock accuracy optimization. There are some unique characteristics for sensor network which make the difficult traditional network clock synchronization approaches. There are some errors occurred in synchronization of clock due to delayed time randomly with some alter notification message between the nodes. High accurate synchronization of clock required huge number of messages to transfer to process some protocol with low system energy which is not possible for higher in accuracy of transmission. Clock synchronization required higher accuracy using variables, based on the requirements of higher layer applications. The process is allowing the probabilistic guarantees with application for optimal use of resources and it produce the better accuracy by compared with deterministic accuracy on all aspect and some of the failure probability in achieving the accuracy is bounded. QoS in networks are extensive in use of the proposed concept with some probabilistic concepts by allowing the access of resources which will be allocated on basis of demand. The existing research is used the concept

to provide the probabilistic clock synchronization using distributed systems.

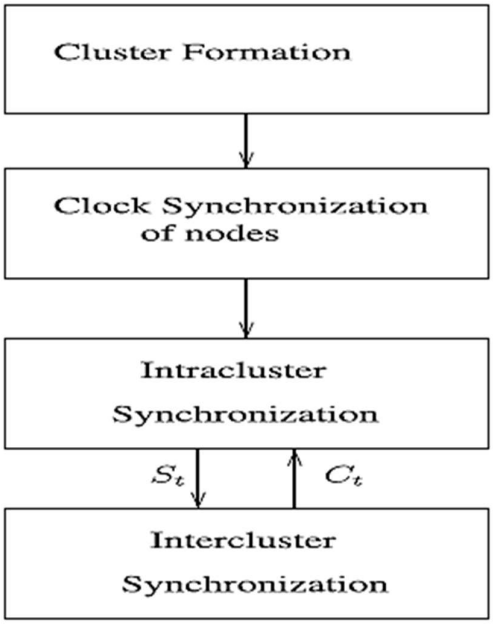

Fig.1. Block diagram of clock synchronization

The existing research about the synchronization of clock with LCM method for removing the offset and skew of clock from nodes. There are some drawbacks in existing models as high energy consumption and measurement of low performance. The proposed CSLCM model will enable the nodes to reach the network synchronization time using some calculation of LCM of clock time (CT) period and the organized network circle as clustered and all the node from a cluster will reach the network for synchronization using its CTP method based on time. The Simulink execution values are explained using proposed algorithm efficiently for comparing the average time synchronization with pair wise message using some parameters like accuracies, overhead of communication and computations.

II LITERATURE STUDY

Time synchronizes using low power with WSN nodes by frequency of clock and variable intervals:

Author proposed a unique synchronization method using WSN with star topology to address the synchronization of time with minimum frequency (F) from clock between the nodes. The protocol is followed based on TDMA with nodes of bi-directional to communicate faster and easier by transmitting the signals to BS with basic interval of time to control the transmission of data. The model is discussed with some energy values for saving the time is major advantage among the challenges. The work reduced the communication for synchronization-based node for saving energy. An individual node clock with super frame accurately used time interval which based on ticks of clock. They proposed the converter for generating the sequence of super frames with varied duration of time and integers are multiplied for every clock moves on average access and reached the goal with some numbers of super duration about the frames. The theory and measurements are the novel approach in the research which leads to variance of error while synchronization.

Dynamic clock synchronization based on sensor networks:

Stated that synchronization of clock is important service in WSN for using the data integration and proposed the TDMA approaches to synchronize the data acquisition. The major issue is WSN concern with the power consumption where the battery with low value which will not replace. The dynamic continues clock synchronization algorithm is proposed to provide clock of common method virtually processed among the nodes.

Time variant estimation using clock period using WSN applications:

Implemented industry application synchronized using sensor node for performing more tasks like multiple parameters sampling based on complex behaviour of machines and the connected nodes with wireless node from base station. The estimator will follow the change on given estimation for calculating the accuracy to predict the values to allow the nodes.

Recursive time synchronization protocol using WSN:

Proposed many applications using WSN and it require some accuracy on time for synchronization for data consistency and coordination. While the protocols used in existing research for synchronization of time will provide the sufficient accuracy with higher energy and poor synchronize from the nodes in distances. The proposed model used RTS protocol with global clock synchronization to produce accurate and energy in efficient way. The propagation of delay to adjust the timestamps of each estimation with least square using linear regression for two different points and analyse the source of errors and efficiency.

Consensus for time synchronization using cluster method:

Implemented the WSN model to extensively worked upon the ability to monitor the various physical phenomenon and time synchronization with fundamental challenges faced by wireless sensor network. Synchronization of time using WSN will worked better to achieve the gaining census among the nodes by reference node with broadcasting using single unit of time to the whole network. The model will implement the novel technique for achieving the fully distributed cluster clock synchronization for all the nodes availed in network using common values. Proposed algorithm employs with clustering and confidence on weighted running average method to offset and skew compensation with efficient protocol for validating the simulation results.

III PROPOSED METHODOLOGY

The proposed method described about the clock synchronization using PI method to define the various process of clock synchronization and the stability of clock is well designed with physical clock which can maintain the frequency constantly and accuracy is referred to maintain the time very well which is true to the standard time. The offset of clock is actual with time in difference between the clocks and skew is differed with frequency. The frequency synchronization will adjust the clocks at run time with same frequency with some particular epoch with exact time. For synchronizing the time, the epoch of clock has same frequency and time. The proposed paper will use the Cristian algorithms for synchronization of clock which will synchronize both frequency and time by applying the Simulink using energy based on protocols with PI method for better execution of the results. The advantage of proposed research is lower energy consumption and measurement of performance is higher.

Cristian's algorithm:

Cristian algorithm is used for synchronizing the time based on server and it will neglect the redundancy of data transmission. The proposed algorithm works between the process and time of server connected with time using sources.

Step 1:	**Start process**
Step 2:	**P request time from S at time t_0**
Step 3:	**Once request received from P, the server S prepare the response (R) and append time.**
Step 4:	**P will receive t_1 which helps to set the time for, T + RTT/2.**

The response time will divided between request and response equally for synchronization and it is error free but it uses unpredictable influences with assumption of value is not true and longer RTT indicates the interference the asymmetrical and offset and jitter are used for synchronization with minimized RTT selection process. Whether the RTT is checked for acceptance based on the time depends on clock drifts with statistics of RTT. Quantity of the clock synchronization is measured and the course is synchronized which optimize the method by its own.

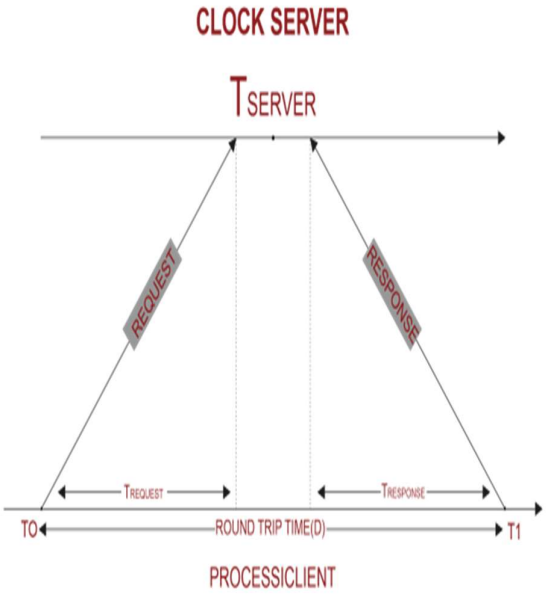

Fig. 2. Cristian algorithm operation with cloud server.

Process of Cristian algorithm:

The client machine sends the signal to the clock server with request time at time T_0 for clock time on server side. The response of client process from request is listen and respond with clock server time and the process will retrieve the response at time T1 and it will use the mathematical formula to determine the synchronized client clock time.

$T_{CLIENT} = T_{SERVER}$ plus $(T_1 - T_0) / 2$ ……..(1)

Were,

T_{CLIENT} denoted as synchronized clock time,
T_{SERVER} denoted as clock time by the server,
T_0 denoted as time which is client process sent request,
T_1 denoted as time with client process received responses.
The client side and real time have some basic difference with time not more than (T1 – T0)/2 seconds to infer the statement which synchronization error for (T1 – T0)/2 seconds at most. Hence it will be mentioned as mathematical equation,

Error E [-(T 1 - T 0)/2, (T 1 - T0) / 2] ……(2)

The main advantage of Cristian algorithm will be no additional information is available and there are some demerits as it restricts the measurement number to estimate the value. It helps to send message to server randomly when time of server receives the message it respond with message as T and the current time of server node will be with clock time of client for sending the message as T0. There are some measurements of T0 – T1 which make the exceed measurement for threshold value which is unreliable and discarded. The measurements are calculated and minimum value is considered for accurate and added with value of T

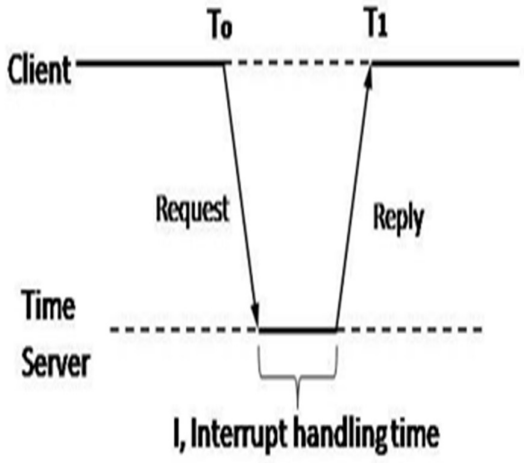

Fig. 3. Response to client from server with reply message.

Encryption & Decryption:

There is a security model known as cryptography where the encryption is one of the processes of encoding the information which authorized the content to user and protect from the third-party users. It does not prevent interception and it denied the message to illegal access and the scheme of encryption is referred to plaintext using encryption algorithm and generate the cipher text for decryption. The sender and receiver will use the key which is same and known to each other to lock and unlock the data using symmetric key operation. The key distribution problem is identified inherently with number of operations and other key does not works to decrypt the encrypted message is the beauty of encryption model. The communicating users need to pair the keys for communication with N number of communicating parties to access the encrypted data, such keys are known as public key and other key is known as private key.

IV RESULTS & DISCUSSION

This section is discussed about the proposed research results with wireless sensor network for clock synchronization data transfer from client to server based on Pi method and Cristian's algorithm as follows,

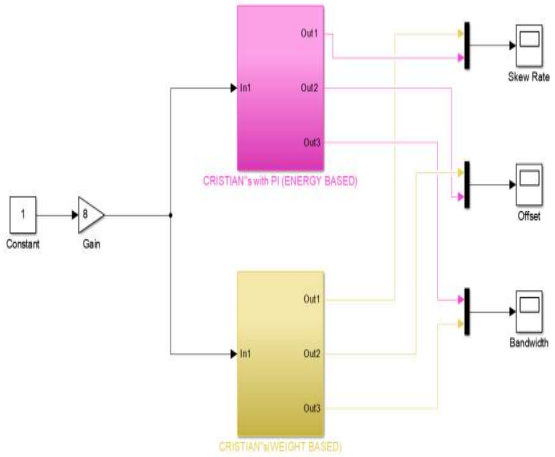

Fig. 4. Cristian algorithm with PI method Simulink model

In figure 4, the Simulink describes the data transmission with constant and gain using Cristian's algorithm and PI method based on energy and weights. The execution of results produced with different metrices like bandwidth, offset and rate of skewness.

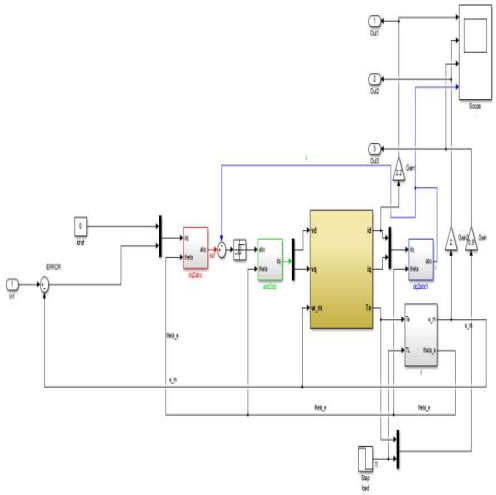

Fig. 5. Cristian's algorithm based on weight Simulink design

In figure 5, the Simulink design for Cristian algorithm with weight-based process is designed for better execution of the proposed research. Followed by this, figure 6, 7, 8 is discussed about the comparison of skew rate, offset and bandwidth of the data transferred from the client to the server with some triggering.

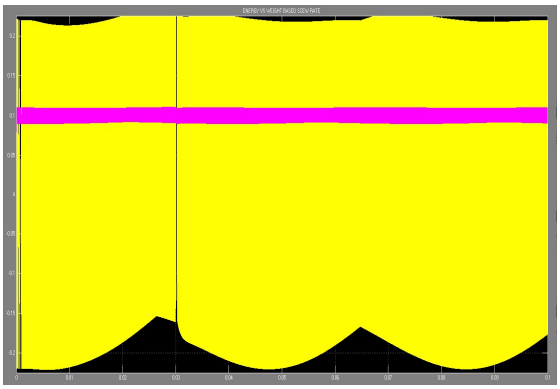

Fig. 6. Energy and weight based skew rate

Fig. 7. Energy and weight based offset rate

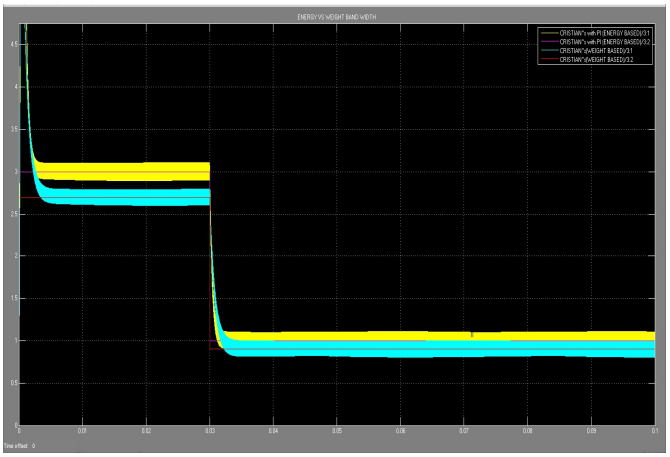

Fig. 8. Energy and weight-based bandwidh rate

Based on energy and weight the offset, bandwidth and skew rate are compared with Simulink execution results shows the data transferred with no error rate and the band width is passed with higher level without any additional space. The Cristian algorithm along with PI method is executed and mentioned in two colors as yellow and blue for comparison of proposed model process. The yellow line in bandwidth result denotes the Cristian algorithm with PI method and

blue color denotes the Cristian algorithm without PI method.

V CONCLUSION

Clock synchronization will belong to core issue of wireless sensor network and it will be useful for network functions and the time stamping of sensor measurements of the signal processing for communication are scheduled. The synchronization of clock is designed with Simulink and used Cristian's algorithm and PI methods for data transmission. The transmission of data using PI method will neglect the lower energy for transmission where the absence of PI method will not transfer the data without any errors. The energy loss will occur without PI method. The proposed work will be implemented with PI method to resend the withdrawn data from the transmission to complete the entire transmission is successfully done and executed in sufficient manner.

REFERENCES

1. Andreas Merentitis, et.al.," WSN nodes based low energy self-testing processors " IEEE transactions on dependable and secure computing, vol. 9, no. 1, 2012.
2. Charalampos, et.al.,„"Data collection model with rendezvous model for energy efficient sensors", IEEE transactions on parallel and distributed systems, vol. 23, no. 5, 2016.
3. Degan, et.al.," WSN based energy balanced routing method on forward aware factor" IEEE transactions on industrial informatics, vol. 10, no. 1, 2014.
4. Wang, et.al., "Mobile ad-hoc network for mobile elements", IEEE transactions on mobile computing, vol. 7, no. 12, 2018.
5. Hana Besbes, et.al., "Neutrality of energy for WSN analytics conditions", IEEE transactions on wireless communications, vol. 12, no. 10, 2018.