Bayesian Smart Gateway and Information driven Based Communication for Noisy IOT Scenario

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Abstract

Assessment in Internet of Things has recently received much attention due to its large application in the areas of object classification, target tracking and medical diagnosis etc. Machine-to-Machine communication plays a significant role in supporting Internet of Thing . This system is concerned about multiuser detection for large M2M supported by Low-Activity Code Division Multiple Access. One major challenge is the huge amount of data generated by the sensing devices, which make the control of sending useless data. To face this challenge, we present a Bayesian Inference Approach , which allows avoiding the transmission of high spatio -temporal correlated data. BIA is based on a hierarchical architecture with simple nodes, smart gateways and data centers. Belief Propagation algorithm has been chosen for performing an estimate inference on our model in order to restore the missing sensing data. BIA is evaluated based on the data collected from real sensors and according to different outlines.

Keywords*:* *IoT, Belief Propagation, Cloud, Smart Gateway, MMV Model, Multiuser Detection.*

1. Introduction

We proposed a Bayesian Inference Approach, which used to avoiding the transmission of high spatio temporal related data[1]. In our praposed system BIA is based on a hierarchical architecture with smart gateways, data centers and simple nodes. Belief Propagation algorithm [2] has been chosen for perform an equities inference on our model in order to reorganize the sensing data. BIA is evaluated based on the data gathered from actual sensors and according to multiple scenarios[3]. The results show that our proposed approach decrease most number of transmitted data and the energy usages, while maintaining an admissible level of data prediction precision.

In our praposed system Bayesian Inference Approach, which allows to remove a huge amount of spatio-temporal relation in an IoT field[1]. In the IoT domain, the belief of a resources is correlated to the physical quantity analysed by the device sensors. Belief Propagation[2] intends the analysis of other neighboring nodes, specially in cases where the data are lossed. In Belief Propagation-based methods, each node examines its belief by computing its local measurement with the credences of its neighboring nodes. BP provide a spatio temporal cooperation from the several devices[3]. A good relation between data is mandatory in such inference problems so it dictates the accuracy of information presumption[4], and hence decreases the approximation error of the global data. purpose. So to avoid this kind of attack, here we are using self-adaptive mechanism because human administrator cannot detect it easily. Adoption of a Bayesian Inference Approach that allows avoiding the transmission of useless data in heterogeneous IoT networks. The BP algorithm has been chosen to infer the missing data; Use of smart gateway based communications in order to decrease the estimation error in the cloud; Performance assessment based on data collected from real sensors[3]. As a starting point before any inference procedure, the design of a graphical model should be provided. Graph- ical models are schematic representations of probability distributions.

we summaries our work ,in chapter 1 we introduced our system and system related work. in chapter 2 there is literature survey in which we Place each work in the IoT context of its contribution to understanding the research problem being studied. Describe the relationship of each work to the others under consideration papers. chapter 3 describes the software quality attribute , software model and methodology, chapter 4 state that the project requirements which is categories in functional and nonfunctional requirements. in chapter 5 we describe the system design , UML diagrams and DFD diagrams related to our system. chapter 6 state that the Application ,limitations and Advantages of system, then in chapter 7 we conclude our system.

2. Methodology of Problem

We propose a BP approach in a cloud-based architecture consisting Solutions of simple nodes, smart gateways and data centers. Each entity in our architecture plays a different role w.r.t the functionalities, the computational and communication capabilities. Our IoT network model may include multiple subnets associated with different applications. Each subnet is composed of IoT devices connected to each others for data sharing, and a smart gateway that relays the data flows to the cloud. The cloud in turn is responsible of inference, storage and all the cloud-based services. In a given IoT application, the sensor nodes periodically collect environmental data, such as temperature, humidity and illuminance, and forward them to the gateways using a multi-hop routing protocol. Then, the gateways collect the data and decide what has to be sent to the cloud. This decision depends on the fact that the gateway knows or not the priori probability of inference error of the used approach.

2.1 Bayesian Inference Approach

Our main goal is to avoid sending useless data, while keeping an acceptable level of data content accuracy. BIA is based on Pearls BP algorithm. To face this challenge, we present a Bayesian Inference Approach (BIA), which allows avoiding the transmission of high spatio-temporal correlated data[1]. BIA is based on a hierarchical architecture with simple nodes, smart gateways and data centers. BIA is evaluated based on the data collected from real sensors and according to different scenarios. The results show that our proposed approach reduces drastically the number of transmitted data and the energy consumption, while maintaining an acceptable level of data prediction accuracy[3].

2.2 Belief Propagation

Once the model has been defined, queries can be performed on the model to find the marginal probability distribution for one node or a set of nodes in the network graph[4]. We use BP algorithm for this purpose and also for the computation cost reason. BP is a well known algorithm for performing inference on graphical models. In general, we assume that some observations are made and some other data about the underlying environment will be inferred. The choice of data to infer is based on the strong correlation between data. Belief Propagation algorithm has been chosen for performing an approximate inference on our model in order to reconstruct the missing sensing data[3]..

2.3 C-IDDS and D-IDDS

Both C-IDDS and D-IDDS are online algorithms which can adapt to stochastic system conditions without any future information. Through rigorous theoretical analysis, we prove that the proposed algorithms can achieve an asymptotically optimal system-wide utility[3]. A real testbed has been built to evaluate the performance of the proposed algorithms in real- world environments. Using the data from the real-world testbed and comparing with some baseline methods, we demonstrate the effectiveness of the proposed C-IDDS and D-IDDS algorithms. The objective of information-driven distributed sensing is to gather the most informative sensing data with a constrained energy consumption. a centralized online scheduling algorithm is used to derive optimal sensing scheduling for efficient Bayesian inference in a centralized way based on stochastic optimal control techniques[2]. As the number of SAs increases, the centralized algorithm suffers from prohibitive communication and computational overhead. Therefore, to address the poor scalability issue of the centralized algorithm, we further propose a distributed online scheduling algorithm based on distributed correlated scheduling. Self-adaptive software systems are able to adapt changes occurred in target system .This framework is capable of adapting runtime behavior of user by MAPE-K model. This model consist of four stages: Monitor, Analyse, Plan, and Execution. These are element which communicates with each other and exchange information through knowledgebase.

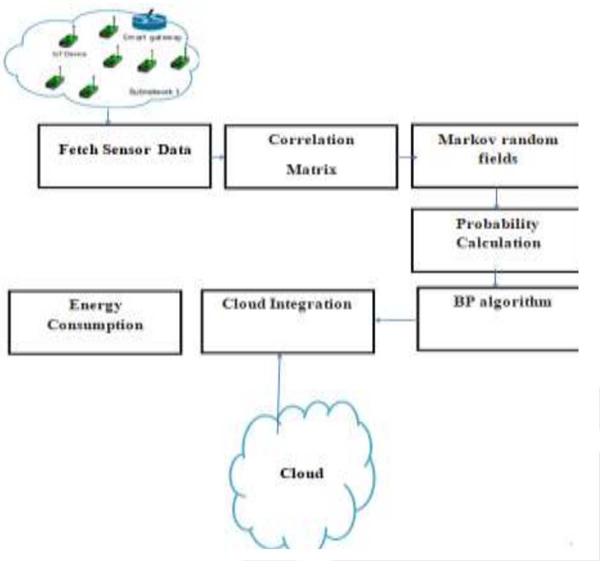


Fig. 1. BLOCK DIAGRAM

2.4 Analysis Model

Agile Model : Agile SDLC model is a combination of iterative and incremental process models with focus on process adaptability and customer satisfaction by rapid delivery of working software product. Agile Methods break the product into small incremental builds. These builds are provided in iteration. Each iteration typically lasts from about one to three weeks. we used agile model for our project development process. We used following functionalities of agile model :

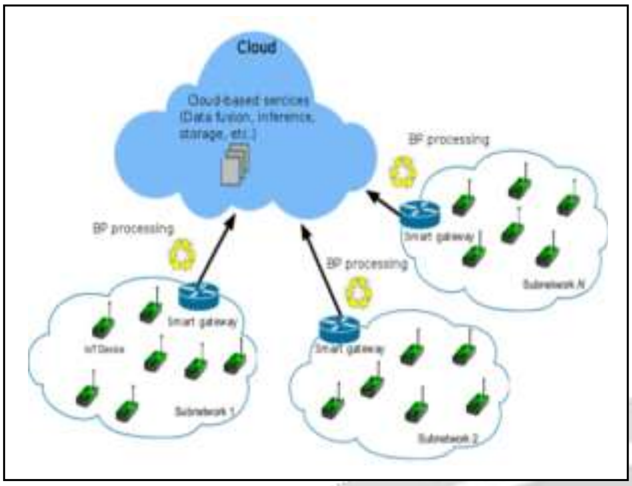
- Planning
- Requirements Analysis
- Design
- Coding
- Unit Testing and
- Acceptance Testing

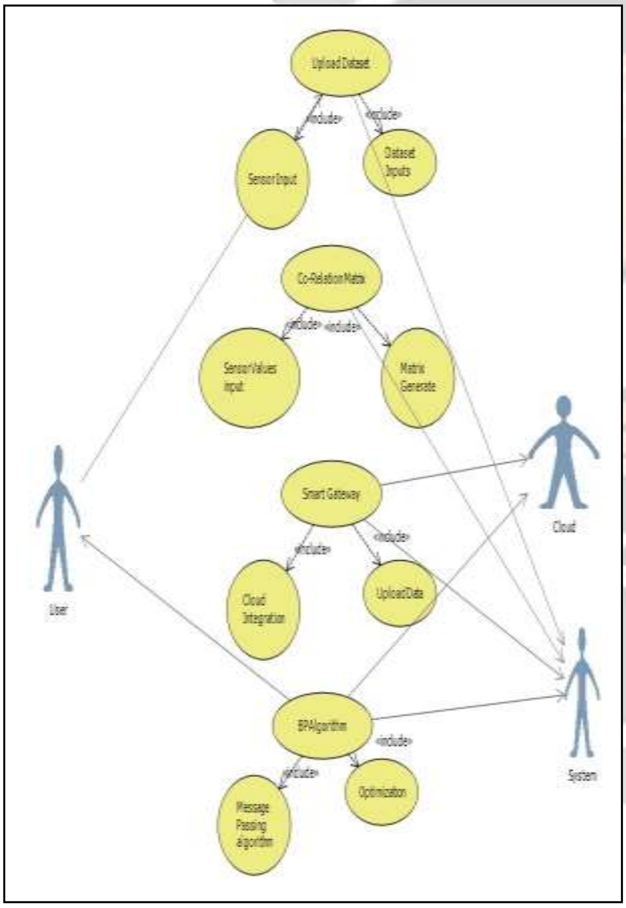
Agile model believes that every project needs to be handled differently and the existing methods need to be tailored to best suit the project requirements. In Agile, the tasks are divided to time boxes (small time frames) to deliver specific features for a release.

3. System Design

A Belief Propagation approach in a cloud-based architecture consisting of simple nodes[1], smart gateways and information centers. Each entity in our architecture plays a different role w.r.t the methods, the computational and communication abilities[2]. Our IoT network model may include many subnets related with different applications. Each subnet is collection of IoT devices connected to each others for data sharing, and a smart gateway that relay the data stream to the cloud[4]. The cloud in turn is responseble of presumption, storage and all the cloud-based services. In a given IoT application, the sensor nodes simultaneously collect environmental information, such as humidity, temperature, and illuminance, and forward them to the gateways using a multi-hop routing protocols. Then, the gateways gather the data and decide what has to be sent to the cloud[3].

This decision depend on the gateway knows or not the priori probability of approximation error of the used method. These data are a subset of the data collected from sensors exerted in the Intel Berkeley Research lab[1]. There is a good relation between temperature and humidity data. It is really simple to draw the regression line between temperature and humidity data. Therefore, it will be more capable to intend temperature value from humidity value or conversely[2] (i.e., infer humidity value from temperature value).





4. Applications

Now a days, many of organisations are storing their important data on cloud. So its need to secure that data from organistaion employee's unauthorized access. This system can be used in Military appliances, Hospitals, Weather Report, Industries, Face Recognition, Information Retrieval, Image Processing, System Biology.

5. Conclusion

We proposed a inference-based approach that permits avoiding transmitting unwanted data in an heterogeneous IoT network. Through costly replication and by using the actual data collected from sensors. we have represent that our Bayesian inference approach decreases many number of transmitted data and the energy usages, while keeping an acceptable level of approximation error and data quality. We have also shown that the use of smart gateway reduces slightly the presumption error. Machine-to-Machine system shows about multiuser detection for that Bayesian Inference Approach decreases the number of transmitted data and the energy usages, while caring an acceptable level of approximation error and data quality. Bayesian Inference method is used for reorganizing sparse transmitted signals of LA-CDMA uplink systems with the time varying user activities, which do not needs value of the user activity factor.

6. Acknowledgement

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References

[1] Cristanel Razamandimby, Valeria Loscr , Anna Maria Vegni, and Alessandro Neri Inria Lille - Nord Europe, Lille, France,"A Bayesian and Smart Gateway Based Communication For Noisy IoT Scenario" ,2017 International Conference on Computing, Networking and Communications (ICNC): Wireless Ad hoc and Sensor Networks, pp. 1-5, 2017.

[2] Xiaoxu Zhang, Ying-Chang Liang, Fellow, IEEE and Jun Fang National Key Laboratory of Science and Technology on Communications, University of Electronic Science and Technology of China (UESTC), Chengdu, P. R. China, "Bayesian Learning Based Multiuser Detection for M2M Communications with Time-Varying User Activities", IEEE ICC 2017 Signal Processing for Communications Symposium, pp. 1-6, 2017.

[3] G. Hannak, M. Mayer, A. Jung, G. Matz, N. Goertz, "Joint channel estimation and activity detection for multiuser communication systems", IEEE International Conference on Communication Workshop (ICCW), pp. 2086-2091, London, June 2015.

[4] Bin Liu, Zhenfeng Xu, Junjie Chen, and Geng Yang. Toward reliable data analysis for internet of things by bayesian dynamic modeling and computation in Signal and Information Processing, IEEE China Summit and International Conference, pp. 1027-1031. IEEE, 2015.

[5] Jonathan S Yedidia, William T Freeman, and Yair Weiss. Understanding belief propagation and its generalizations. Exploring articial intelligence in the new millennium, pp. 236-239, 2003.

[6] Mirza Mansoor Baig and Hamid Gholamhosseini. Smart health monitoring systems: an overview of design and modeling. Journal of medical systems, pp. 1-14, 2013.

[7] Chaohui Wang, Nikos Komodakis, and Nikos Paragios. "Markov random eld modeling, inference learning in computer vision image understanding: A survey." Computer Vision and Image Understanding,2013.

[8] S. C. Ergen, H. S. Tetikol, M. Kontik, R. Sevlian, R. Rajagopal, and P. Varaiya, "RSSI-ngerprinting-based mobile phone localization with route constraints," IEEE Transactions on Vehicular Technology,Jan. 2014.

[9] S. Chuasomboon, "A comparison of ranging and localization techniques in indoor, urban and tunnel environments," Masters thesis, Linkoping University,June 2013.