

Machine learning and Data mining in Home Automation

Patel Meetkumar Jayendrabhai¹, Prof.(Dr.) Satyadev Vyas², Prof. Chintan Nagrecha³, Prof. Ashish Gajjar³

¹ Student, Computer Engineering, Ahmedabad institute of technology, Gujarat, India

² Head of the department, Computer Engineering, Ahmedabad institute of technology, Gujarat, India

³ Assistant Professor, Computer Engineering, Ahmedabad institute of technology, Gujarat, India

ABSTRACT

Home automation and Internet of Things are gaining popularity nowadays. In today's world, Automatic systems are being preferred over the manual system. A Smart home automation system is based on making user life easier. The Internet of Things generates a huge amount of data. Additionally, it contains a huge number of sensors and their data which can control or monitor objects.

This paper verbalizes about how big machine learning and data mining use for converting the normal home automation to the smart home automation system. Here the user of this system can control their home using their smartphone as well as computer or any devices which are connected to the internet. And also get suggestions [using prediction algorithm], reminder, and alerts additionally system interact with user

Keyword Home Automation, IoT, Machine learning, Data mining, Smart home

1. INTRODUCTION

In recent years, there has been a growing interest among consumers in the smart home automation concepts. Nowadays there are various home automation systems are available in the market which provides users are able to control their home remotely with a single command on or off. The current research focuses more on the engenderment of the smart home, a home that is able to control and make a decision on its own.

This study firstly Introduces IOT (Internet of things) and machine learning. These are more and more growing nowadays. Internet of things contains a huge number of sensors which can measure temperature, light, noise, distance, pressure, motion, speed and so on. These sensors also produce a large amount of data. Here we are talking about how we are using this data to produce more automation. Now a day we need effective and reliable solutions for storing that large amount of data which are produced by sensors based on big data and cloud based platforms, we believe that this data contains highly useful and valuable information and that not much attention has been taking in analyzing this data to make it smart. In our study, we investigate how data mining and machine learning techniques can play important role in finding an appropriate pattern and transforming them into valuable things for the end user of our system. Here we are using this data to predict user's next step and provide valuable suggestions and give more automation.

2. FUNCTIONAL ARCHITECTURE

Using the proper format makes it easier to analyze data using data analytics techniques. We could distribute main functions and make level wise categories.

- Visualization

- Statistics
- Data mining
- Machine learning

Here we can see the first level functional architecture of our system in the figure.

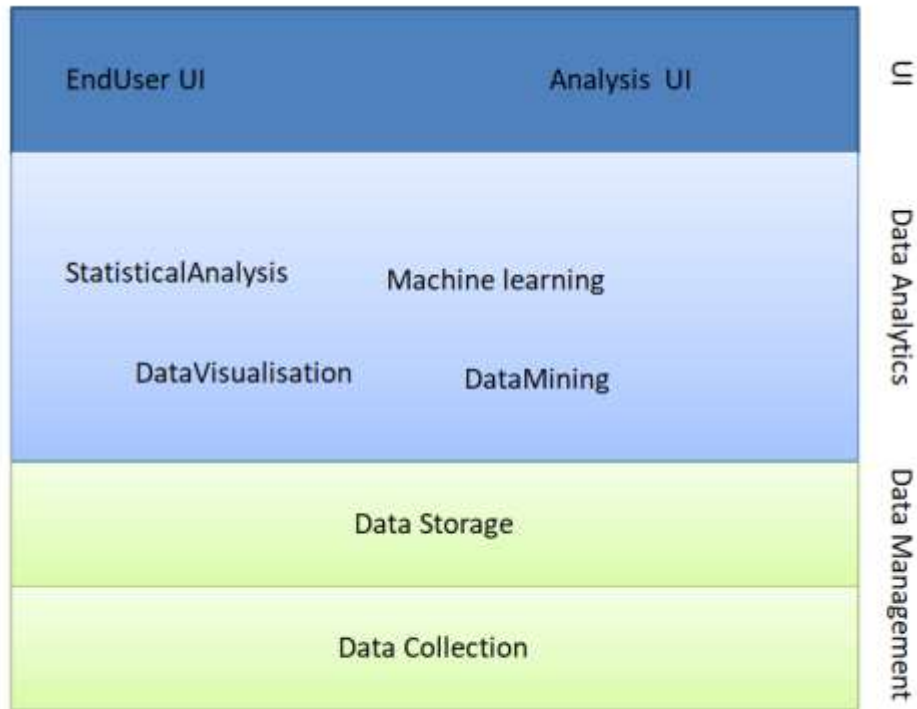


Fig-1 Functional Architecture

In Figure, we can see that the functional architecture is mainly divided into three part UI, Data analytics, Data Management.

2.1 Data Management

Data management layer is most important part of this functional architecture. It manages all data which are produced directly or indirectly by sensors. It collects data which are produced by sensors and then it stores this data in their respective databases or cloud platforms. And this data is useful for the data analysis layer.

2.2 Data Analytics

Data analytics layer is responsible for analyzing data which are produced by sensors and giving appropriate or understandable format or graphical representation. In this layer, we are finding patterns with past data or analysis and comparing with past analytical data and producing some predictable moments for end-user.

2.3 User Interface UI

In our architecture, there are two types of user interface available, Enduser interface and Analysis Interface. End user interface contains all functionality which is operated by users like user can turn on or off any fan or light using this

interface. End user interface directly connected with the user. Another one is analysis user interface which provides all analytical data and their graphical representation which produced by sensors. In this interface, we can configure all configuration of our system.

3 DATA PROCESSING ARCHITECTURE

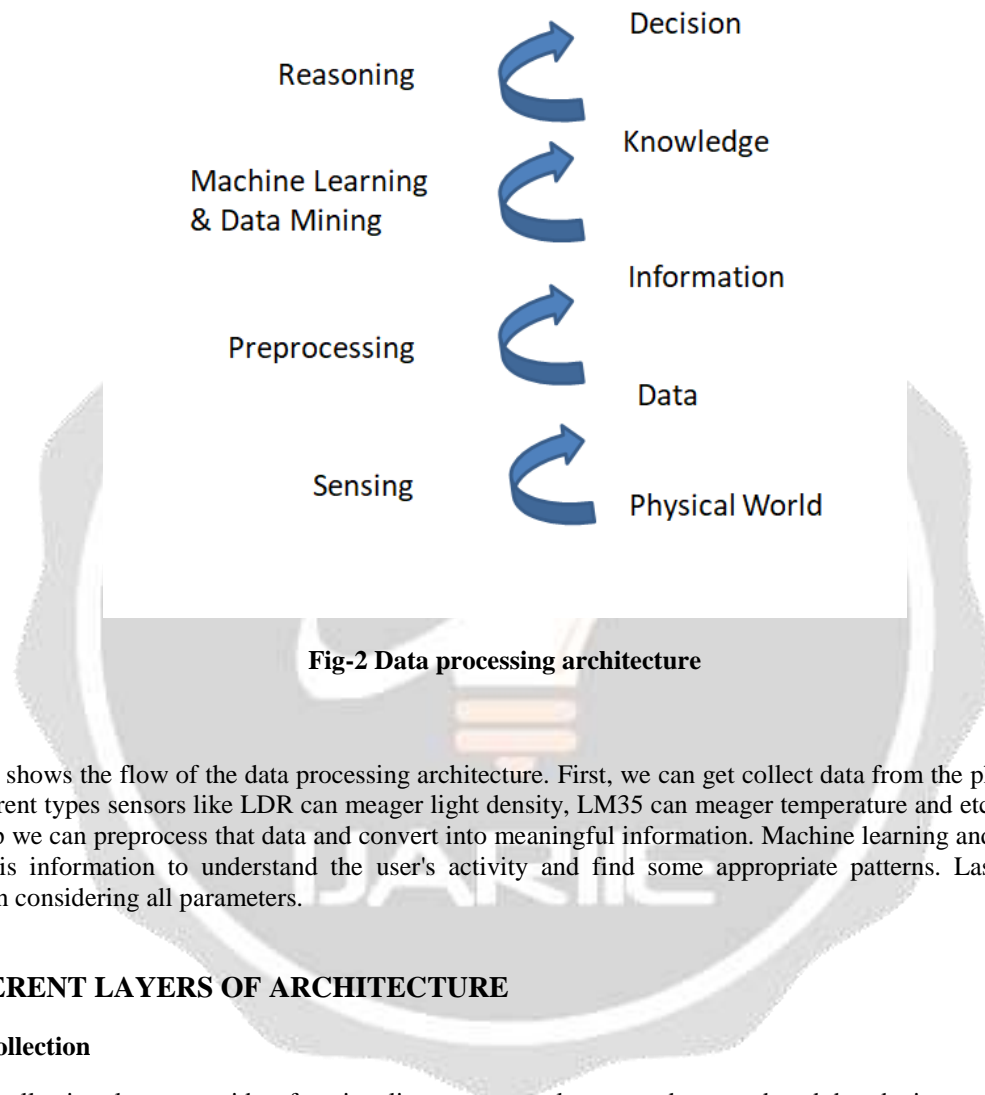


Fig-2 Data processing architecture

This figure shows the flow of the data processing architecture. First, we can get collect data from the physical world using different types sensors like LDR can meager light density, LM35 can meager temperature and etc. Then in the second step we can preprocess that data and convert into meaningful information. Machine learning and data mining can use this information to understand the user's activity and find some appropriate patterns. Lastly its make Decision on considering all parameters.

4 DIFFERENT LAYERS OF ARCHITECTURE

4.1 Data collection

The data collection layer provides functionality to accumulate any data produced by devices present in the environment. Sensors and devices can push their data into database For instance in the home automation smart-home solution they send events messages containing their identifier, the type of data they produce and the value of the data. Events are occurring whenever the value measured has changed since the last emission.

4.2 Data Storage

According to our study, we have to perform data mining and machine learning algorithms, once we collect the data, we need to store their data into a dedicated database or cloud platforms. According to the volume of data to be the store we might need big data storage solution or standard relational database. In internet of things, there are a huge amount of sensors. Home automation each event issued by their devices or sensors readings.

4.3 Data Preprocessing

When we want to apply Data analytics techniques or machine learning algorithms Firstly we have to clean the data which are produced by the sensors or devices/modules. We have arranged this data in a standard form which is applicable to all data produced by different sensors. We have to define which data are important and which data are ignorable. After data preprocessing process we made an understandable database which is useful in next layers.

4.4 Data visualization

Visualizing data is an efficient and potent way for the terminus utilizer as well as for the accommodation provider to get an expeditious insight of the health status of the contrivances as well as of activities taking place in the habitation when of course, all contrivances operates correctly.

4.5 Data mining

Data mining is the process of finding a meaningful pattern out of a large data repository. In data mining task aims at discovering frequent part from a sequence of events. The benefit of identifying frequent part is we can evaluate the daily routing of the user. This approach has been useful to identify and predict the user activity.

Clustering: This task aims at grouping elements from an astronomically immense set of elements so that the elements inside the same group are more akin to each other, then element belonging to different groups.

4.6 Machine learning

Machine learning and data mining can give an important role to make any normal home automation to the smart home automation system. Its help to predict user activity.

Machine learning has a remotely homogeneous objective than Data mining with the difference that the patterns found are executable structures which can be applied to a fresh data in order to predict future data or infer incipient data

Classification: This task aim at appropriate determine a category to which a given observation belongs. The approach makes use of a training set containing observations correctly classified.

Regression: It is similar to the classification task in the case where possible values for the category are numerical instead of categorical. In the context of the Smart Home, a decision could be made on how to adjust the heater thermostat predicated on the same sensors quantifications.

5 CONCLUSIONS

Recently, the home automation and IoT (Internet of things) market are growing very fast and need vast range of development that can be carried out in the concept of smart home-automation. In our paper, we are trying to give more automation using machine learning and data mining concepts. Here we are trying to predict user activities and gave appropriate suggestion to the user. Our motive to provide more comfortable and convenience system for the smart user.

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