International Journal of Latest Trends in Engineering and Technology
Special Issue SACAIM 2017, pp. 524-527
e-ISSN:2278-621X

STUDY ON PREDICTIVE ANALYTICS ALGORITHMS IN SMART HOME

Sandhya S[1] & Shama S Shetty[2]

Abstract: –Smart home is new innovation growing continuously now. It integrates of large portions new advances through home systems administration for moving forward human's personal satisfaction about living, with the goal there need a significant number undertakings looking into in different advances with apply of the home framework. The residents can control many aspects of the home from anywhere at an time such as lighting, home appliances and entertainment by using home networking. This paper will briefly survey the various types of home networking technologies. The topics is based on the definition of smart home and the details of smart home elements including smart home networks that can be classified into two main types, which are wiring system and wireless system, smart home controllers that use for managing system, the appliances or the smart devices and the challenges of smart home. This paper also offers many interesting projects summarily, so it can be ideas for whoever want to learn this technology.
Keywords- Smart Home,Trie,Active LeZi, LZ78

1. INTRODUCTION

Smart home technology is a collective term for information- and communication technology as used in houses, where the various components are communicating via a local network or wi-fi .The Smart home technology also makes the automatic communication with the surroundings possible, via the Internet, via mobile phones .

In some cases when the electrical equipment is plugged in but it is not in use, there still has the flow of electricity. That means we will lose the electrical energy, so that we are wasting money for no reason. Moreover, it can cause of may electrical short circuit that may also be cause of many accident .on the other hand, The people who are forget to unplug they have to remind it for all time . So, in smart home technology people can access it from outside only to control their electrical equipment.

In smart house it used to make all electronic equipment around the home act "Smart", So we can say smart home has highly advanced automatic systems for lighting, temperature control, security and many other functions.

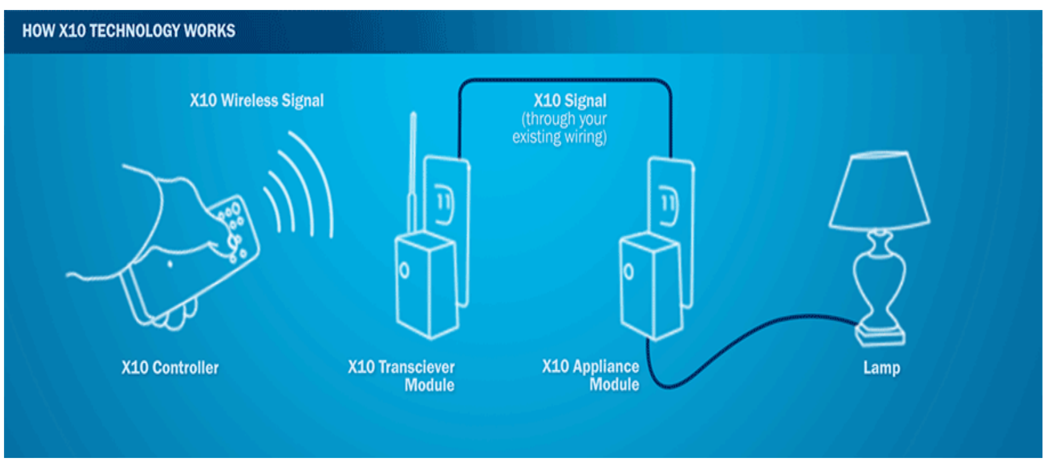

Figure1. X10 Technology

In figuew1 shows X10 Technology. A case of exceptional technology is X10, which is open standard for home mechanization. X10 transmits binary information utilizing the Amplitude Modulation (AM) technique. And X10 controllers send signals over existing AC wiring to recipient modules. Different technology are HomePlug, Consumer Electronics Bus (CEBus), European Installation Bus.

In wireless system, WiFi uses radio waves (RF) to allow two devices to communicate with one another. The technology is most commonly used to connect Internet routers to devices like computers, tablets and phones; however, it can be used to

[1] MCA III Semester, St Aloysius College, AIMIT, Mangaluru, Karnataka, India
[2] MCA III Semester, St Aloysius College, AIMIT, Mangaluru, Karnataka, India

connect together any two hardware components. WiFi is a local wireless network that runs of the 802.11 standards set forth by the Institute of Electrical and Electronics Engineers (IEEE) [1].

2. SMART HOME DESIGN

The architecture of a Smart Home is divided into four layers:

a) Physical Layer
b) Communication Layer
c) Information Layer
d) Decision Layer

Physical Layer: This layer holds those essential fittings inside the house including distinctive devices, transducers and network hardware.
Communication Layer: This layer includes software to format and route information between agents, between users and the house, and between the house and external resources.
Information Layer: This layer gathers, stores, What's more generates information helpful to choice making.
Decision Layer: this layer selects movements for those agenize should execute In view of data supplied starting with other layers.
Perception is a bottom-up process. The sensors monitor the environment (e.g. the temperature of the home) and, if necessary, transmit the information to another agent through the communication layer. The database records the information in the information layer, updates its learned concepts and predictions accordingly, and alerts the decision layer of the presence of new data.

3. VERSATILITY MODEL

A Wireless network system is connected to the entire home. To communicate each other from one device to another .Here we use Prediction Algorithm in Smart home to be worn by the tenant. This keeps monitoring the user movement. When Smart Home needs to communicate to device, the system starts a look for the objective terminal gadget by surveying all zones where it can be found. At this time all terminals start communicate and the only target object send the response. Here we use prediction Algorithm to update user movement.

Figure2.versatility model

4. PREDICTION ALGORITHMS

4.1 LZ78 Algorithm:

The LZ78 data compression is an incremental parsing algorithm based on the Markov model. This algorithm has been interpreted as a Universal modeling scheme that sequentially calculates empirical probabilities in each context of the data; the generated probabilities reflect contexts seen from the beginning of the parsed sequence to the current symbol.

The LZ code length of any individual sequence attains the Markovian empirical entropy for any finite Markov order. This algorithm parses an input string "x 1, x 2 … x i " into c(i) substrings "w 1 ,w 2 ,... w c(i) " such that for all j>0, the prefix of the substring w j (i.e., all but the last character of w j) is equal to some w i for 1<i<j. Because of this prefix property, parsed substrings can efficiently be maintained in a trie.

The LZ78 is used only as a system that breaks up a given sequence (string) of states into phrases.

```
Algorithm:
 initialize dictionary := null
initialize phrase w := null
 loop
wait for next symbol v
if ((w.v) in dictionary):
w := w.v
else  add (w.v) to dictionary
 w := null
increment frequency for every
possible prefix of phrase
endif
forever
```

Consider the sequence of input symbols nx = "aaababbbbbaabccddcbaaaa". An LZ78 parsing of this string of input symbols as per above mentioned algorithm of LZ78 ,would yield the following set of phrases: "a,aa,b,ab,bb,bba,abc,c,d,dc,ba,aaa". As described above, this algorithm maintains statistics for all contexts seen within the phrases w i thesetext statistics are stored in a trie. Dictionary: a 5 aa 2 b 4 ab 2 bb 2 bba 1 abc 1 c 1 d 2 dc 1 ba 1 aaa 1

The LZ78 algorithm suffers from the slow convergence problem. This is because, all the information crossing phrase boundaries is lost. In many situations, there will be significant patterns crossing phrase boundaries, and these patterns will affect the next symbol in the sequence [5]. Eg. In above example string (aaababbbbbaabccddcbaaaa), 6th symbol (bba) and 7th (abc) does not form phrase baab.

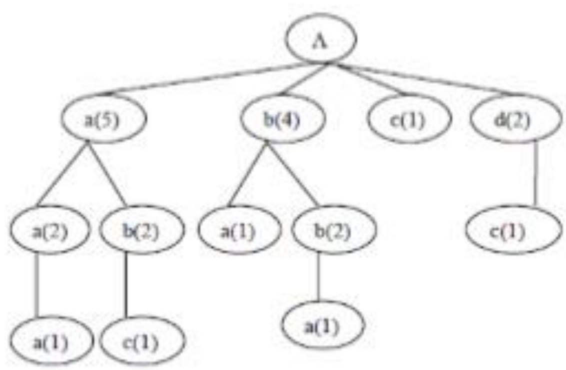

Figure 3. Trie formed by LZ78 parsing of the string "aaababbbbbaabccddcbaaaa"

4.2 Active LeZi Algorithm:

The Active LeZi is an on-demand algorithm that is based on Markov models and primarily stores the frequency of input patterns in a trie according to the compression algorithm LZ78. The amount of information being lost across the phrase boundaries increases rapidly when there is an increase in the number of states seen in the input sequence. This problem can be overcome by maintaining a variable length window of previously-seen symbols. The length of the longest phrase seen in a classical LZ78 parsing is chosen as equal to the length of window at each stage. The reason for selecting this window size is that the LZ78 algorithm is essentially constructing an order-k-1 Markov model, where k is equal to the length of the longest LZ78 phrase seen so far. Within this window, we can now gather statistics on all possible contexts. This builds a better approximation to the order-k Markov model, because it has captured information about contexts in the input sequence that cross phrase boundaries in the classical LZ78 parsing. Therefore, we gain a better convergence rate to optimal predictability as well as greater predictive accuracy [5].

Algorithm:

```
initialize dictionary:= null
initialize phrase w:= null
initialize window: = null
initialize Max_LZ_length = 0
loop
wait for next symbol v
if ((w.v) in dictionary):
w:= w.v
else
add (w.v) to dictionary
update Max_LZ_length if necessary
w:= null
endif
add v to window  if (length(window) > Max_LZ_length)
delete window[0]
endif
Update frequencies of all possible
contexts within window that includes v
forever
```

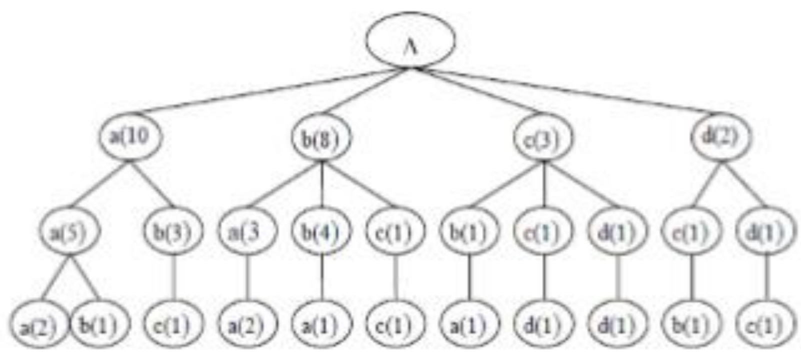

Figure 4. Trie formed by Active LeZi parsing of the string "aaababbbbbaabccddcbaaaa"

Characteristics of Active LeZi are as follows:

a) A growing-order Markov model attains optimal FS predictability, due to the optimality of LZ78.
b) As the length of the longest LZ78 phrase grows, Active LeZi stores more and more information; as the input sequence (the experience) grows, the algorithm performs better. This is a desirable characteristic of any learning algorithm.

ALZ is a growing-order Markov model that attains optimal predictability faster than LZ78 because it uses information that's inaccessible to LZ78.

5. EPISODE DISCOVERY

The prediction results obtained from the prediction algorithm above can be used to automate interactions with the home, removing the need for manual control of devices. However, these automated actions can be annoying or detrimental if the inhabitant must undo the action executed by the house or repair damage caused by a faulty decision. To eliminate the possibility of frequent occurrence of this event, the episode discovery becomes a necessary part of Smart Home prediction.

6. REFERENCES

[1] Aditi A. Dixi, http://www.ijmlc.org/papers/405-LC120.pdf.
[2] N. Monekosso, P. Remagnino, and Y. Kuno, Intelligent Environments: Methods, Algorithms and Applications, Springer, 2009, ch. 1, pp. 1-11.
[3] P. Gorniak and D. Poole, "Predicting future user actions by observing unmodified applications," AAAI-00 Proceedings, 2000.
[4] M. Hartmann and D. Schreiber, "Prediction algorithms for user actions," LWA'07, pp. 349-354, 2007.
[5] S. K. Das, D. J. Cook, A. Bhattacharya, E. O. H. Iii, and T.-Y. Lin, "The role of prediction algorithms in the mavhome smart home architecture," IEEE Wireless Communications, December 2002