# IMPLEMENTATION OF 4G BASED HOME AUTOMATION USING IOT

[1]Nisha , M. Tech Scholar, ECE Dept. OITM, Hisar(125001),Haryana, India
[2]Poonam Beniwal, Asst. Prof., ECE Dept. OITM, Hisar(125001),Haryana, India

**Abstract:** 4G in todays form has evolved from wired telephones to analog wireless sets to digital wireless communication with high speed data transmission. The evolution of 4th Generation has to be through 1G , 2G & then 3G. In this research we will use 4G technology and IOT based Home Automation and we will need to transfer multimedia data such as status of device on/off and sun intensity. Here data is stored on remote database server and instruction is set from users end to set the status of devices on/off. In this way user can manage the domestic appliances. Here we are also using feature of Virtual Presence of 4 G technology. A virtual environment has been developed as there are button to increase the sun intensity, switch on / the house hold devices so that user could use Virtual Navigation feature of 4G Technology.

**Keywords:** 4G, IOT, IP, HOME AUTOMATION, 3G, 2G, 5G, Solar energy system

## [1] Introduction of 4G

4G, short for 4th generation, is fourth generation of mobile telecommunications technology, succeeding 3G. A 4th Generation system would be expected to provide support to potential & current applications including mobile web access, IP telephony, gaming services, high-definition mobile TV, video conferencing, 3D television, & cloud computing. The first operational cellular communication system was set up in Norway in 1981 & was followed by similar systems in United States & United Kingdom. These first generation systems provided voice transmissions by using frequencies around 900MHz & analog modulation.

The term 4G has been kicking around for a few years now so chances are you've probably heard it mentioned at some point or another. Simply put, 4G is shortened name for fourth generation of wireless data transmission networks set-up by mobile phone industry in order to offer more bandwidth & greater speeds for everyday mobile device operations, such as messaging, video calling & mobile TV.

You might have been using 3G phones for a while & used internet over air, but 4G is basically more speedy & stable. Like your home broadband in comparison to your previous dial-up modem service.

## [2] DATA RATE COMPARISON

First ,when wireless generation started ,it was analog communication. That generation is 1G. They used various analog modulation for data transfer. Now when communication migrated from analog to digital ,foundation of latest communication were led. Hence came 2G.

**1G Technology**:

I. 1G refers to first generation of wireless telephone technology, mobiletele communications which was first introduced in 1980s & completed in early 1990s.

II.  It's Speed was upto 2.4kbps , allowed voice calls in 1 country.

III.  It used Analog Signal & AMPS was first launched in USA in 1G mobile systems

**Drawbacks:**

- Poor Voice Quality
- Poor Battery Life
- Large Phone Size
- No Security
- Limited Capacity
- Poor Handoff Reliability

**2G Technology:**

- 2G technology refers to 2nd generation which is based on GSM.
- It was launched in Finland in year 1991 & used digital signals.
- It's data speed was upto 64kbps.

**Features include:**

- It enables services such as text messages , picture messages & MMS (multi media message).
- It provides better quality & capacity.

**Drawbacks:**

- 2G requires strong digital signals to help mobile phones work. If there is no network coverage in any specific area ,digital signals would weak.
- These systems are unable to handle complex data such as Videos.

**2.5G Technology**

2.5G is a technology between second (2G) & third (3G) generation of mobile telephony.

It is sometimes described as 2G Cellular Technology combined with GPRS.

**Features Includes:**

- Phone Calls
- Send/Receive E-mail Messages
- Web Browsing
- Speed : 64-144 kbps
- Camera Phones

**3G Technology:**

- 3G technology refer to third generation which was introduced in year 2000s.
- Data Transmission speed increased from 144kbps- 2Mbps.
- Typically called Smart Phones & features increased its bandwidth & data transfer rates to accommodate web-based applications & audio & video files.

**Features Include:**

1. Providing Faster Communication
2. Send/Receive Large Email Messages
3. High Speed Web / More Security
4. Video Conferencing / 3D Gaming
5. TV Streaming/ Mobile TV/ Phone Calls
6. Large Capacities & Broadband Capabilities
7. 11 sec – 1.5 min. time to download a 3 min Mp3 song.

**Drawbacks:**

1. Expensive fees for 3G Licenses Services
2. It was challenge to build  infrastructure for 3G
3. High Bandwidth Requirement
4. Expensive 3G Phones.

5. Large Cell Phones

## 4G Technology:

- 4G technology refer to or short name of fourth Generation which was started from late 2000s.
- Capable of providing 100Mbps – 1Gbps speed.
- One of  basic term used to describe 4th Generation is **MAGIC**.

## Features Include:

1. More Security
2. High Speed
3. High Capacity
4. Low Cost Per-bit

## Drawbacks:

1. Battery uses is more
2. Hard to implement
3. Need complicated hardware
4. Expensive equipment required to implement next generation network.

## [3] APPLICATION OF 4G

Enhanced Mobile Gaming Experience enhanced wireless capabilities that deliver mobile gaming interaction with latency less than five milliseconds. Play online multiplayer games while travelling at high speeds or sitting outside. Personal Media Repository Create a personal media repository that could be accessed from home & on  road to view photos , watch movies & listen to your personal music collection , Virtual presence using hologram-generating virtual reality programs that could provide an artificial presence just about anywhere. For example , if you want to personally respond when someone rings your front door while you are away from home.

Broadband Access in Remote Locations 4th Generation networks would provide a wireless alternative for broadband access to residential & business customers. In addition , 4G would provide  first opportunity for broadband access in remote locations without an infrastructure to support cable or DSL access.

## Multimedia

Multimedia is content that uses a combination of different content forms such as text, audio, images, animation, video & interactive content. Multimedia contrasts with media that use only rudimentary computer displays such as text-only or traditional forms of printed or hand-produced material. Multimedia could be recorded & played , displayed , dynamic , interacted with or accessed by information content processing devices , such as computerized & electronic devices , but could also be part of a live performance. Multimedia devices are electronic media devices used to store & experience multimedia content. Multimedia is distinguished from mixed media in fine art; by including audio , for example , it has a broader scope. The term "rich media" is synonymous for interactive multimedia. Hypermedia scales up amount of media content in multimedia application.

## Virtual Presence

Telepresence refers to a set of technologies which allow a person to feel as if they were present, to give appearance of being present , or to have an effect , via telerobotics, at a place other than their true location. Telepresence requires that    users'

senses be provided with such stimuli as to give feeling of being in that other location. Additionally, users may be given ability to affect remote location. In this case, user's position, movements, actions, voice , etc. may be sensed , transmitted & duplicated in remote location to bring about this effect. Therefore information may be traveling in both directions between   user & remote location.

**Virtual Navigation:**

One of   most notable advanced applications for 4G systems is location based services. 4G location applications would be based on visualized, virtual navigation schemes that would support a remote database containing graphical representations of streets, buildings, & other physical characteristics of a large metropolitan area. This database could be accessed by a subscriber in a moving vehicle equipped with   appropriate wireless device, which would provide   platform on which would appear a virtual representation of    environment ahead.

## [4] PROPOSED WORK

In this research we will use 4G technology and IOT based Home Automation and we will need to transfer multimedia data such as status of device on/off and sun intensity. Here data is stored on remote database server and instruction is set from users end to set the status of devices on/off. In this way user can manage the domestic appliances. Here we are also using feature of Virtual Presence of 4 G technology. A virtual environment has been developed as there are button to increase the sun intensity, switch on / the house hold devices so

that user could use Virtual Navigation feature of 4G Technology.

Broadband Access in Remote Locations 4th Generation networks would provide a wireless alternative for broadband access to residential & business customers.  4G would provide   first opportunity for broadband access in remote locations without an infrastructure to support cable or DSL access.

The application is Tele-Geo processing Applications as it controlling devices from remote location. The user is actually at distance location and handling domestic devices such as Television, Desktop, Refrigerator from hand held devices such as palmtop or tablet.

## [5] TOOLS AND TECHNOLOGY

### TECHNICAL REQUIREMENT

### HARDWARE
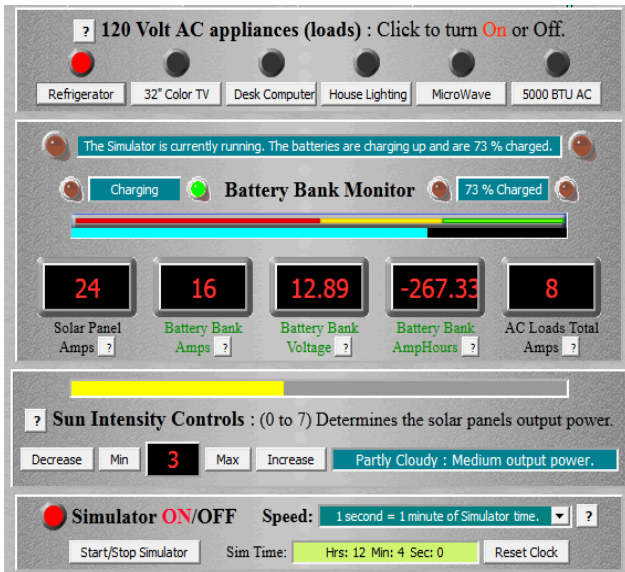
1. CPU (More than 1 Ghz)
2. RAM (More than 1Gb)
3. Keyboard
4. Mouse
5. 4G Modem
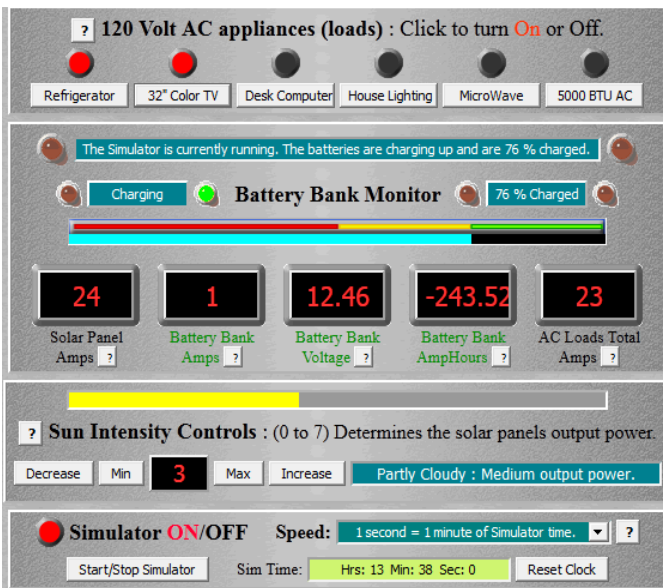
### SOFTWARE

1. Windows
2. .NET
3. SQL SERVER
4. MATLAB

## [6] IMPLEMENTATION

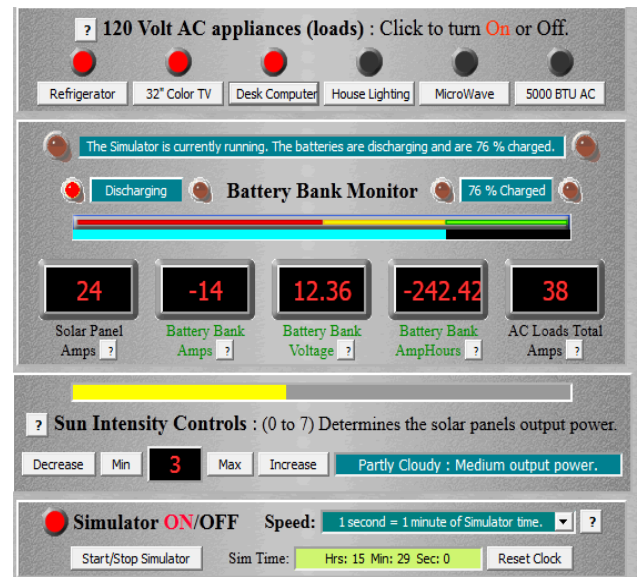**CASE 1** Refrigerator is on & sun intensity is 3

**Fig 1 Refrigerator is on & sun intensity is 3**

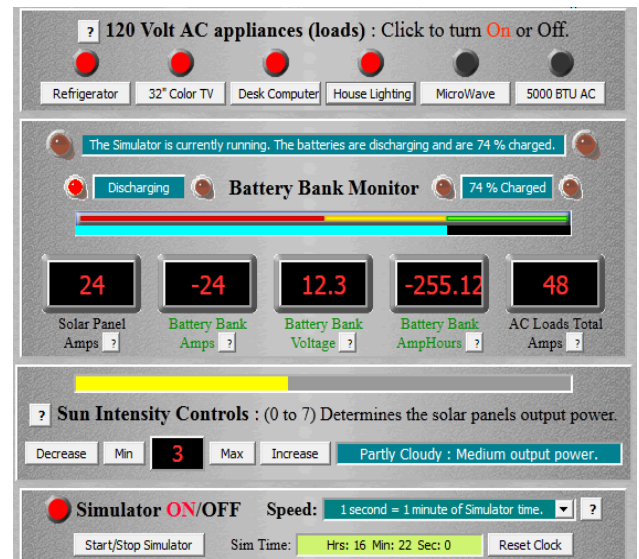**Case 2** Refrigerator & tv is on & sun intensity is 3



**Fig 2** Refrigerator & tv is on & sun intensity is 3

**Case 3:** Refrigerator,tv,Desk computer is on & sun intensity is 3
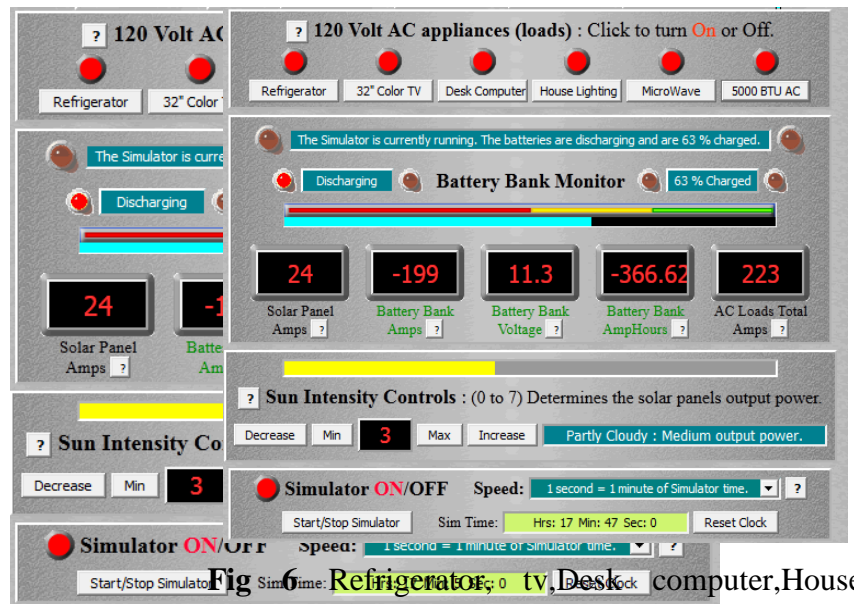


**Fig 3** Refrigerator,tv,Desk computer is on & sun intensity is 3

**Case 4 :** Refrigerator,tv,Desk computer & house lighting is on & sun intensity is 3



**Fig 4** Refrigerator,tv,Desk computer & house lighting is on & sun intensity is 3

**Case 5:** Refrigerator,tv,Desk computer,House lighting,microwave is on & sun intensity is 3

| Sun intensity | Solar Panel Amp | Battery Bank Amps |
|---|---|---|
| **0** | 0 | -8 |
| **1** | 8 | 0 |
| **2** | 16 | 8 |
| **3** | 24 | 16 |
| **4** | 32 | 24 |
| **5** | 40 | 32 |
| **6** | 48 | 40 |
| **7** | 56 | 48 |



**Fig 5** Refrigerator, tv, Desk computer, House lighting, microwave is on & sun intensity is 3

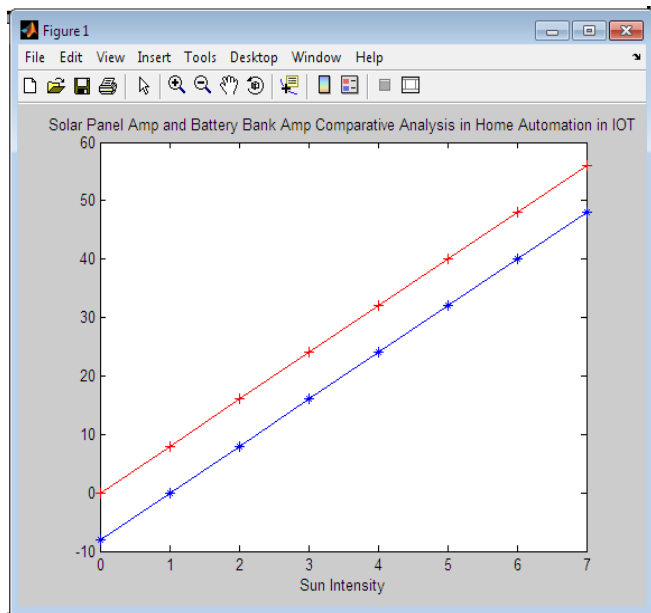**Fig 6** Refrigerator, tv, Desk computer, House lighting, microwave, 5000 BTU AC is on & sun intensity is 3. Solar Panel Amps, Battery Bank Amps when Refrigerator is on

**Case 6:** Refrigerator, tv, Desk computer, House lighting, microwave, 5000 BTU AC is on & sun intensity is 3

## [7] Result and discussion

**Refrigerator is on**

Table 1 Solar panel Amp



**Fig 7** Solar Panel & Battery Bank Amp Comparative Analysis in Home Automation in IOT
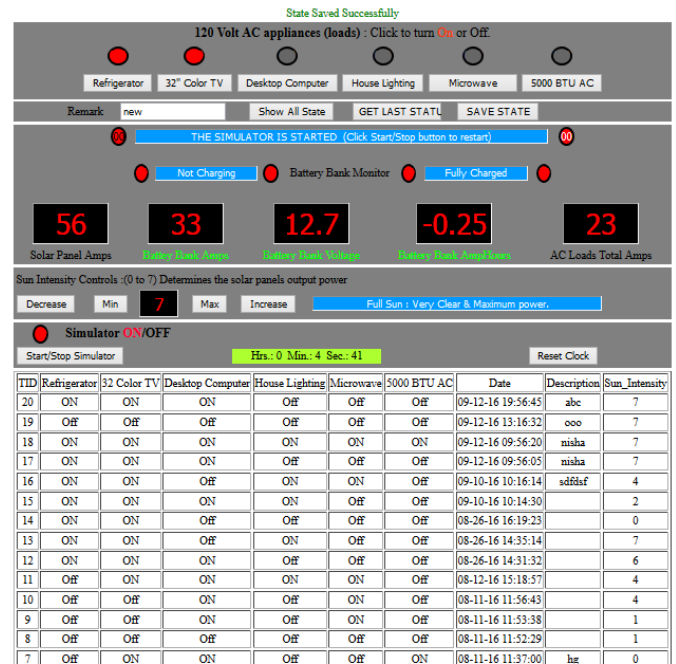
**Getting stored status using show all state**



**Fig 8 Getting stored status using show all state**

**To save the status click on save state to finalize the current status**



**Fig 9** To save the status click on save state to finalize the current status
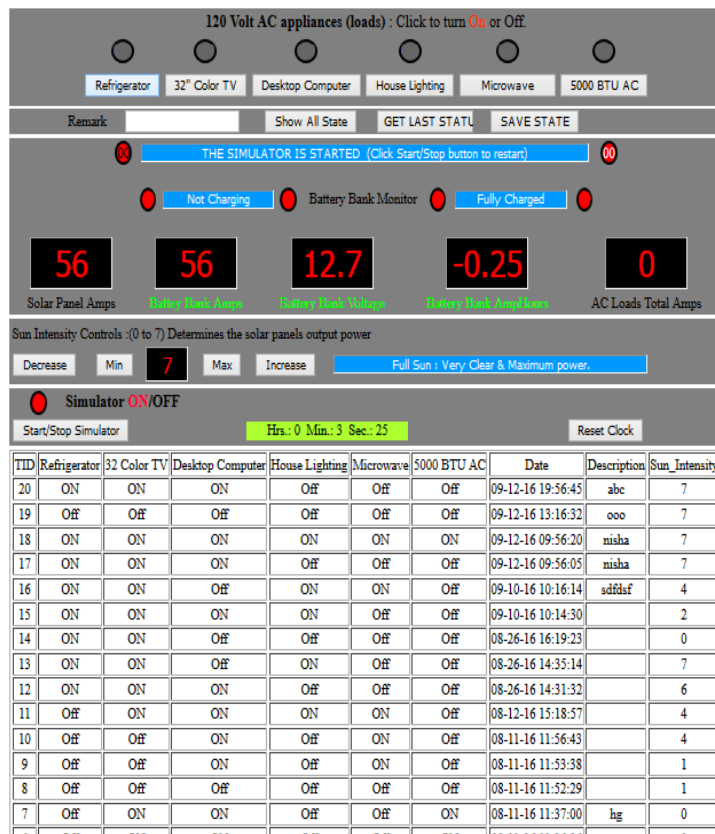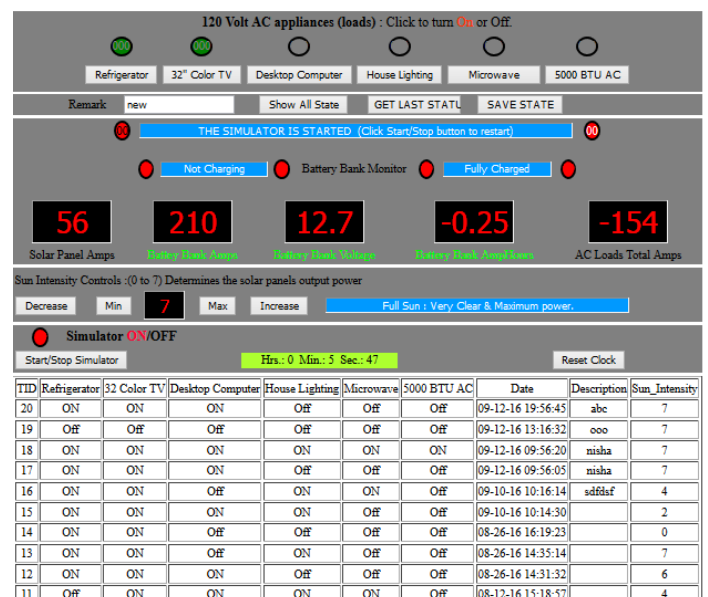
**Click on get last status to get current status of devices**

**Fig 10** Click on get last status to get current status of devices

## [8] Conclusion

In this research we have used 4G technology and IOT based Home Automation and we will need to transfer multimedia data such as status of device on/off and sun intensity. Here we are also using feature of Virtual Presence of 4 G technology. A virtual environment has been developed as there are button to increase the sun intensity, switch on / the house hold devices so that user could use Virtual Navigation feature of 4G Technology. Here data is stored on remote database server and instructions are set from users end to set the status of devices on/off. In this way user can manage the domestic appliances. The application is Tele-Geo processing Applications as it controlling devices from remote location. The user is actually at distance location and handling domestic devices such as Television, Desktop, Refrigerator from hand held devices such as palmtop or tablet. In order to program & control flow of information in Internet of Things, a predicted architectural direction is required. It is being called BPM. Everywhere that is a blending of traditional process management and special capabilities to automate control of large numbers of coordinated devices. Consequently, this will not necessarily require common standards that will not be able to prefer every context or use: some actors accordingly be self-referenced and if ever needed, adaptive to active common standards. Some researchers give that 4G networks are most essential component of Internet of Things.

## REFERENCE

1. T. Abdelzaher, S. Prabh, and R. Kiran, On Real-Time Capacity Limits of ad hoc Wireless Sensor Networks, *RTSS*, December 2004.
2. Y. Aguiar, M. Vieira, E. Galy, J. Mercantini, and C. Santoni, Refining a User Behavior Model based on the Observation of Emotional States. *COGNITIVE ,* 2011.
3. V. Bradshaw. The Building Environment: Active and Passive Control Systems. John Wiley & Sons, Inc., River Street, NJ, USA, 2006.
4. B. Brumitt, B. Meyers, J. Krumm, A. Kern, and S. A. Shafer. Easyliving: Technologies for Intelligent Environments. *HUC,* 2000.
5. Bouet, M. ;Nguengang, G. ; Conan, V. ; Kousaridas, A. ; Spapis, P. ; Alonistioti, N."Embedding cognition in wireless network management: an experimental perspective",Communications Magazine, IEEE,Vol. 50 ,Issue: 12,2012 , Page(s): 150 – 160
6. Bennis, M. ;Simsek, M. ; Czylwik, A. ; Saad, W. ; Valentin, S. ; Debbah, M.,"When cellular meets WiFi in wireless small cell networks", Communications Magazine, IEEE, Volume: 51 , Issue: 6,2013,Page(s): 44 – 50.
7. M. Sauer, A. Kobyakov, and J. George, "Radio over fiber for picocellular network architectures," Lightwave Technology, Journal of, vol. 25, no. 11, pp. 3301–3320, Nov. 2007.
8. T. Rappaport, Wireless Communications Principles an Practice. Upper Saddle River, NJ: Prentice Hall, 1999.
9. M. Huang, J. Li, X. Song, and H. Guo, Modeling Impulsive Injections of Insulin: Towards Artificial Pancreas. *SIAM Journal of Applied Mathematics 72*, 5, 2012, pp. 1524–1548.
10. M. Kay, E. Choe, J. Shepherd, B. Greenstein, N. Watson, S. Consolvo, and J. Kientz, Lullaby: a Capture & Access System for

Understanding the Sleep Environment. *UbiComp,* 2012.

11. A Liu, and D. Salvucci, Modeling and Prediction of Human Driver Behavior, *Intl. Conference on HCI* , 2001.

12. J. Lu, T. Sookoor, V. Srinivasan, G. Gao, B. Holben J. Stankovic, E. Field, and K. Whitehouse, The Smart Thermostat: Using Occupancy Sensors to Save Energy in Homes, *ACM SenSys,* 2010.

13. D. Wake, A. Nkansah, N. Gomes, C. Lethien, C. Sion, and J.-P. Vilcot, "Optically powered remote units for radio-over-fiber systems," Lightwave Technology, Journal of, vol. 26, no. 15, pp. 2484–2491, Aug.1, 2008.

14. J. Guillory, S. Meyer, I. Siaud, A. Ulmer-moll, B. Charbonnier, A. Pizzinat, and C. Algani, "Radio-over-fiber architectures," Vehicular Technology Magazine, IEEE, vol. 5, no. 3, pp. 30 –38, 2010.

15. I. Haratcherev, C. Balageas, and M. Fiorito, "Low consumption home femto base stations," in Personal, Indoor and Mobile Radio Communications, 2009 IEEE 20th International Symposium on, 2009, pp. 1 –5.

16. Y.Hie, F.Yu, K. Achan, E. Gillum, M.Goldszmidt and T.Wobber. "How Dynamic are IP Addresses". In Proc. Of ACM SIGCOMM, 2007.