SLAMS-Self Learning Automated Monitoring System

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Outline

- Prerequisite Skills
- Introduction to IoT and Smart Home
- What is SLAMS?
- Features
- Limitations
- Future Prospective

Skills needed for this project

HTML

CSS

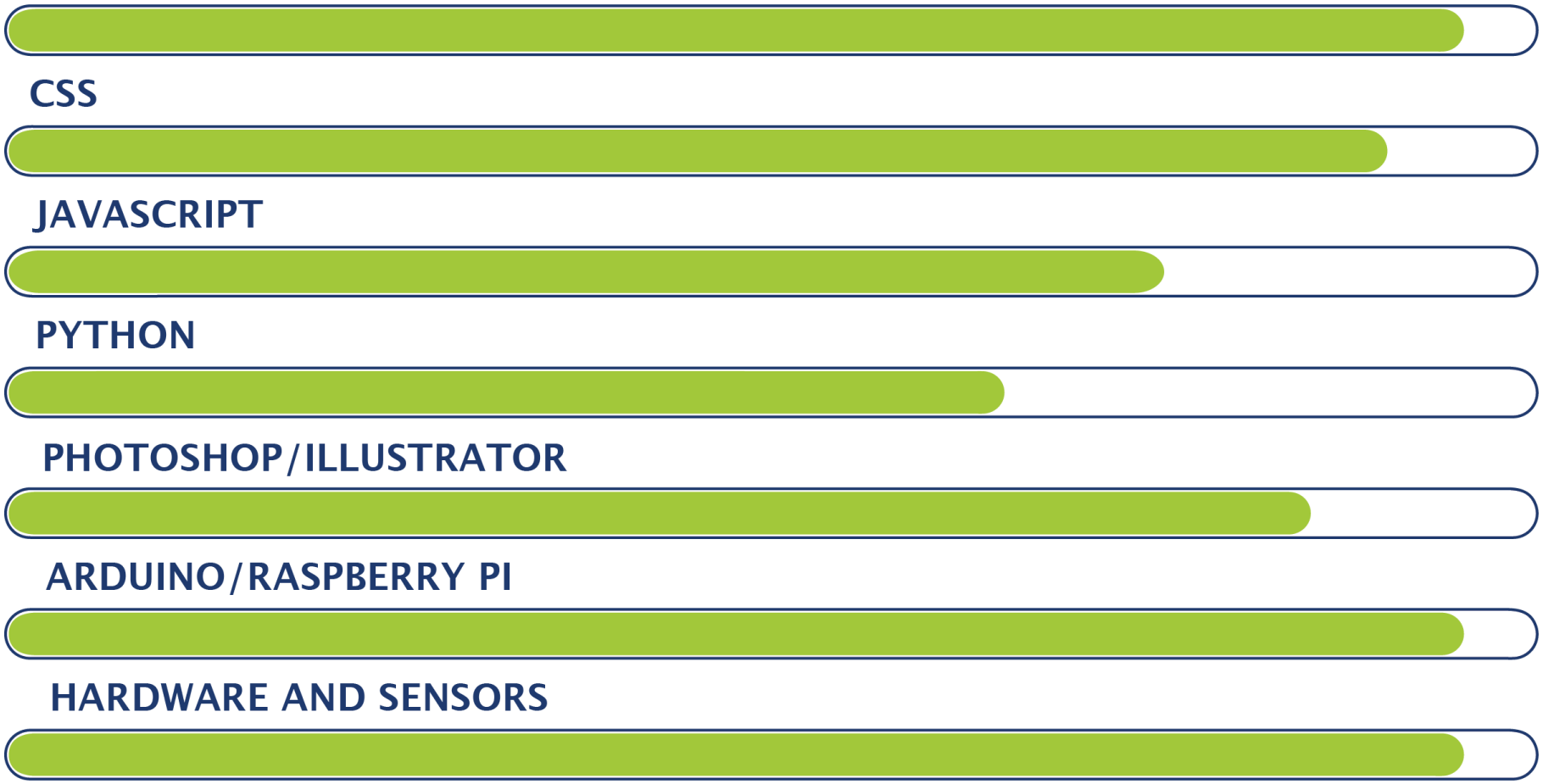
JAVASCRIPT

PYTHON

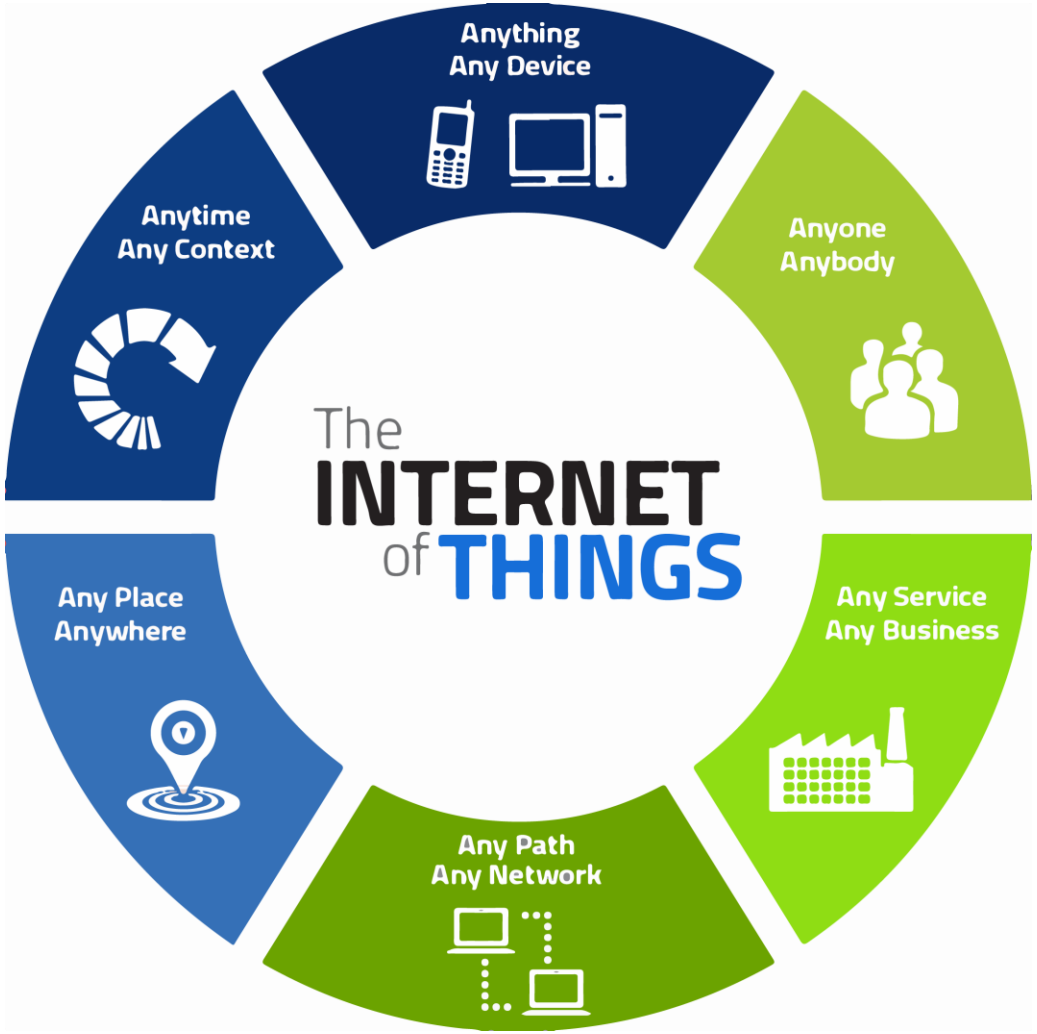
PHOTOSHOP/ILLUSTRATOR

ARDUINO/RASPBERRY PI

HARDWARE AND SENSORS



Internet of Things (IoT)



Internet of Things (IoT)

- IoT is a network of physical objects embedded with software, sensors, circuits and network connectivity.
- The future of IoT is inspired by “everything that can be connected, will be connected”.
- “Things” in IoT refers to a wide variety of devices such as home appliances, heart monitoring implants, automobile with built-in sensors, field operation devices etc.
- Smart Home is one of the main applications of internet of things.

What is a Smart Home?

Courtesy: http://rethink-iot.com

Objectives of Smart Home

- To securely connect everything in home to internet.
- Bring your home to digital life and make day-to-day chores easier. Make your home a smarter place to live.
- Optimally utilizing the available resources, which is imperative in present world.

Presenting to you.. SLAMS!

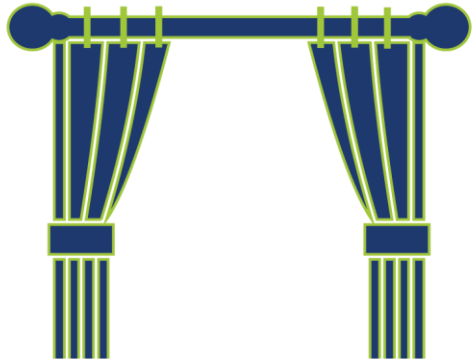
Intro to SLAMS!

- *SLAMS* stands for Self-Learning Automated Monitoring System.
- ***Self-learning:*** The system learns and adapts to user's habits over time.
- ***Automated:*** Various things and appliances in home are controlled using web portal and mobile application.
- ***Monitoring:*** Things like doors, air quality, temperature etc. can be monitored using a system comprised of variety of sensors.

Features

Light and fan control

Door Security



Automatic curtains

Safety Features

Health Care

Secure Login Page

- The webpage has a login page with username and password for each user.
- This ensures that unauthorized access does not take place and unknown person does not take control of the house.

Automatic/Manual Transition

- On/off switch control 

- Manual mode: User can manually control the settings of house.
- Automatic mode:
  - Sensors calibrate the settings automatically.
  - User gets updates as notification on mobile app.

Control and Secure Remote Access

- One of the most important features of a smart home.
- The states of all appliances can be accessed and controlled remotely.
- Zigbees are used for communications among the devices.

Door Security System

- Secure mode can be turned on when the user goes out.
- Notification is received when someone else trespasses the property.
- Ultrasonic sensors are used for this purpose.

Automatic Curtains

- Curtains can be opened and closed using mobile app and web portal.
- Curtains will open themselves when sunlight falls on the LDR sensor attached to window.
- Curtains will automatically adjust according to different modes (further discussed in AI slide).

Fire Alarm

- Fire alarm is implemented using LM-35 temperature sensor.
- When temperature follows unusually abrupt pattern e.g. rise in temperature at high rate, then a notification is sent to the user.
- A buzzer is also installed to ring loudly; in case of fire.

Air quality sensing

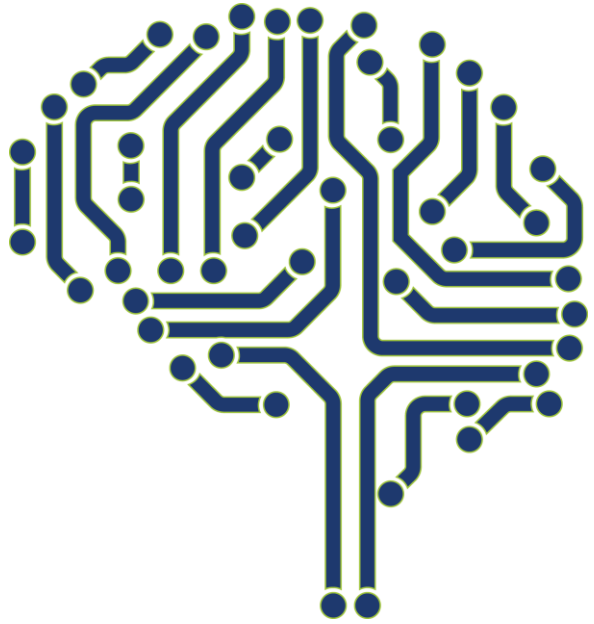
- Monitors Carbon Dioxide (CO_2) levels in the house and displays in the app.
- The levels are analyzed against global CO_2 levels and user is notified in case of significant difference.
- The user is also notified if CO_2 above the safe levels.

Temperature and humidity

- The temperature and humidity in the house is continuously monitored
- The readings are accessible to the user via app.
- User is notified in case of sudden temperature change.

Artificial Intelligent System

- The system uses machine learning to learn the habits of the users in home.
- After a certain time, enough learning occurs to suggest various settings to the users (e.g. speed of the fan).
- Suggestions are given to the user, whether to open curtains depending on the outside conditions.



Automated Servers

- If the power disrupts, the server restarts from the same state that it was previously at.

- The server saves the latest data it receives in the database(MySQL) and restores it when it regains power.

Web security

- Whenever a device is connected through Wi-Fi, its mac address is noted and saved.
- The user can mark familiar devices and can block any mac address as needed.
- System shows last seen time for different devices.
- Online/offline status of currently connected devices is available.

SOS button

- SOS button is the International Morse Code distress signal.
- On pressing this button, all the other users will get a notification informing about the situation of emergency.
- Notification is of the format: *“Amit needs help at (‘latitude’, ‘longitude’)”.*
- Modern apps such as Apple Maps and Google Maps can visually show the exact location using coordinates.

Modes

Movie Mode

- Turns off the lights, closes curtains and makes perfect environment for watching a movie

Sleep Mode

- Turns off the lights, closes curtains and turns on door security making user comfortable and forget the tiredness of the day

Away Mode

- Turn off every appliance and switch on the door security system

Morning Mode

- Open curtains, turn on lights allowing for a fresh start of the day

Present Limitations

- Air quality sensors (MQ135) are capable of measuring benzene, alcohol, ammonia, etc. But we have used it for CO_2 only.
- After switching from manual mode to automatic mode, last saved automatic database will be incorporated.
- Switching modes is possible only through mobile or web. So if these are inaccessible, the user becomes helpless.
- Data in the website does not update dynamically. We have to refresh the page to see the new data.

Future Prospect

- Using face-mapping technique, our system can learn different habits of different users in home and adapting home according to different users.
- Face-mapping can also be integrated for security and tresspassing purposes.
- Usage of various appliances can be monitored for any time period.
- Cameras can be installed in smart home and using that we can directly monitor the house using your phone or laptop no matter where you are.
- Using voice assistant like Amazon Echo, Siri, etc. to control all the devices which are interconnected to grid.

Future Prospective

- Backup power can be provided to servers and door security system so that in case if MCB is turned-off; even then security if home won't be compromised.
- Using voltage, current and power profile of different devices, we can remotely see which device is connected to a particular switch and that can be turned-off.
- Number of people can be counted in a room and appliances will automatically turn-off after a specific period of time if no one is present.

Thank You !

> The Internet of Things has the potential to change the world, just as the Internet did. Maybe even more so.
>
> *- Kevin Ashton, MIT*

This presentation bears an imprint of many people,
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