Medi-Caps University

ARIIMA

A Real IoT Implementation of a Machine-Learning Architecture for Reducing Electricity Consumption

SYNOPSIS OF PROJECT

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Introduction:

As the adaptation of technology and electronic appliances within the ecosystem are increasing, need of methodologies for lowering their energy consumption is also increasing. In this field, we contribute with the implementation of an infrastructure that gives support to Internet-connected appliances to reduce their energy waste in an intelligent manner. Our work is for now focused on household appliances located in common spaces like Kitchen, Bathroom, Gallery, Parking etc. which include tube lights, fans and bulbs where people usually forget about saving energy. The proposed approach lets these kind of appliances report their usage patterns and to process their data through analytic and predictive algorithms. The aim lies that such prediction of the appliances get back their next-week usage forecast in order to operate autonomously as efficient as possible. The underlying distributed architecture design and implementation is discussed in this Synopsis, together with the strategy followed to get an accurate prediction matching with the real data retrieved by the devices.

Objective:

The potential of the Electronic Appliances to drive a sustainable everyday life is more than probable. This fact is easily evidenced through its current application domains such as agriculture, education, home or in industrial settings.

However, it is still controversial how other myriads of these devices (everyday consumer appliances, fitness trackers or kitchen appliances) can be also labelled as green devices along their life-cycle: from manufacturing to disposal. These new devices are designed to replace old-fashioned ones. Therefore, their inclusion will rise to an augment of electricity waste that probably will result in high consumption of natural energy resources.

Our project describes the implementation of an approach that addresses this latter challenge. Our proposal lies in two pillars: First, it is focused on embedding intelligence through open hardware electronics within everyday appliances of shared use (e.g. tube lights, fans, led bulbs etc.). Our aim is transforming these electronic devices into smart and efficient eco-aware everyday things rather than replacing them by new ones.

As a proof of concept, in the presented work we have focused on household appliances in four different vicinities. The second pillar, it is to design and implement a infrastructure that enables to these eco-aware appliances to reduce their energy waste. It is devised to intelligent process in the back-end the most efficient operation mode at any time for each shared device and to give back such information to them, i.e. the appliances are able to operate autonomously in an eco-friendly manner. We have named this architecture ARIIMA as an analogy with the predictive model used to forecast the appliance's usage.

Scope:

If programs, schemes, and initiatives are designed keeping in mind the visually impaired, aged elders, physically challenged, or even people with tight schedules then barriers could almost cease to exist. Keeping the same in mind our basic motto behind this project is that "We can extend the boundaries of science beyond traditional modes of operation that rely heavily on sight and manual operation that will help achieve more efficiency in energy usage in daily life."

We are trying to invoke the other senses in order to make appliance operation meaningful to those who are either challenged or don't focus much on minor changes to the operation as after all such small changes on a large scale make all the changes in the society.

A combination of necessary training tailored to the unique needs of each user, and solid algorithms, is going a long way towards saving energy more efficiently.

Problem Statement:

Before we expect the benefits of schemes like Digital India to extend to the population, we need to widen our purview of people. We should be able to perceive possibilities that exist for people in our society, our country and eventually in the entire world.

- **Existing system:** The existing system lacks in various resources that we encountered while interacting with, which includes the unavailability of the efficient systems. This in turn, consumes a lot of energy and costs a lot more which reduces the effectiveness of the system. We also had a conversation with the mundane consumer regarding these issues. They informed us that many people want to opt for energy efficient devices but due to their high cost and maintenance, they are not able afford home automation devices.

- **Proposed system:** We have tried to eliminate these issues and provide a platform where the commonplace customer can post their requirements and the interested people can directly reach to them. On the same hand, we also tried to create a system through which the consumer can use outdated devices using IOT.

Platform Specification:

Hardware specifications:

Hardware versions- can be internal devices or external devices; allow specialized software programs to integrate speech output. Depending on the software program used to read the screen and play the notes material. We are using Arduino Uno in our project and a computer to program it.

Processor	ATmega328P
RAM	3 KB
Hard Disk Capacity	32KB(Internal) + 4GB(External)
Input Devices	All Electronic Devices, AC Relay
Output Devices	Simple Data Sheet

Software specifications:

The basic requirement of our project will be the database where we can update the needs and store the data along with the complete details of helpers and students. We will be meeting all the requirements related to database fulfilled by MS-Excel and Python Data Frames through Pandas library.

Front End	Wired Connections
Back End	C, Python
Database	M.S. Excel, Python Pandas Data Frame
Web Browser	Google Chrome

Advantages:

There are a lot of benefits, an electricity consumer can get through this system-

- They can reduce the electricity bills and save a sufficiently good amount of overall annual expenditure.
- This system provides a centralised access to the user for both manual and digital control over the devices.
- The system, using machine learning algorithm, can predict the peak hours of energy consumption and reduce the energy waste.
- This system, through sensors, can implement home automotation in very less cost.

Conclusion:

The model will be used in the following applications in day-to-day life of a regular person and help in reducing efforts and providing accessibility from anywhere in the world. Some of its broad applications are -

- It will reduce the requirement of high-end costly devices to achieve the same goal.

- It has very easy interface and also no special training is required to use the system, moderately skilled electrician can implement the system in the house.

- With sufficient reduction in energy consumption we can save a significant amount and resources deployed to electricity production and all those resources can be used for some other productive task.

Future Prospects and Possibilities:

- Use of this technology in Industries and Shopping Malls to reduce significant energy in the regions where unnecessary usage of appliances in being done.

- With more research and data efficiency can be increased.