

**THE**

**FORE RUNNERS**

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**Degree:** BSc (Honours) Software Engineering

**Stage:** 3

**Batch:** 14.2

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Gruha Pathi 1.0 - A new frontier in HOME Automation

Project Initiation Document (PID)

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# Introduction

The idea chosen for this project is Home Automation, I named the project as Gruha Pathi (GP) meaning House Lord. Gruha Pathi grants convenience, security and freedom for people to manage their house more efficiently.

All electrical equipment, water supply and house protection acts as a unified system that can automatically take decisions based on the information gathered from numerous sensors placed in the house. Electricity usage and total control over all the electrical appliance plugged into the system can be remotely controlled or let the system take decisions based on the information available.

Water flow management is one of the crucial factors that we fail to address in a house for the simple reason that we have plenty of water available in the country 24/7 but that doesn’t mean pure water is forever available in every part of the country. 80% of water used in the kitchen and in cloth washing machines can be filtered and used in toilets with the help of Gruha Pathi.

*“Don’t let a single drop of rain water flow into the sea.”* – King Parakramabahu the Great.

Simply having a CCTV camera system never helps to protect a house from unwanted parties because after a crime has been committed there is very less reason with having only evidence but an automated system that can protect your house from unwanted parties is an ideal solution, with Gruha Pathi this is possible.

Time is a precious commodity that must not be wasted so instead of manually controlling appliances and knowing the usage it is better to be informed by an automatic system. The main key stakeholders of Gruha Pathi are the house owners.

# Business Case

## Business Needs

Present market for home automation in Sri Lanka is almost non-existent. The available products for home automation are separate components that acts individually rather than a complete unified system, for example Dialog Home Automation.

Due to the present busy nature in Sri Lankan workforce most of the household needs and maintenance are never done which paves the way tremendous expenses annually to just maintain and repair. This scenario can be completely remedied through a home automation system that can easily help maintain and organize household needs.

## Business Objectives

To increase the productivity and effectively manage a house based environment by-

* Establish an awareness of the advantages of Gruha Pathi to increase sales.
* Effectively maintain and observe the electrical, water and gas usages of a house.
* Implement an effective and efficient household protection system that can work as an artificial security officer.
* Build the home automation system at an affordable cost thus the sale of a system can increase the profit.
* The usage reports generated by the individual systems (With the consent of the house owner) can be used as surveys for the improvement of the system.

# Project Objectives

1. Fully function smartphone application that can manipulate the system to be developed.
2. Complete standalone desktop application that can further enhance the manipulation of the system to be developed.
3. Fully functional hardware components that can work together or alone in a situation and are reliable.
4. To provide security and effective reliance of managing the house tasks with ease.
5. Build a grand database of all survey information generated by individual systems to siphon information that can help develop the system further.

# Initial scope

Initial Features of the system: -

1. User will be able to control any home appliance from anywhere in the world through the Internet.
2. User will be able to monitor
   1. Current status of the home appliance.
   2. Check water level of the water tank
   3. Home temperature and humidity
3. User will be able to open house door/windows.
4. Integrated Home Security System (burglar Detection)
5. User will be able to do above things using android application or desktop application

# Method of approach

## Software Development

Main focus lies in the development of three main controlling components of the system:

1. **Desktop Application**

Enable the user to control the house environment within the house. Contains all the functionality of the smartphone application but lacks the security and authority granting interfaces. Through this application the system can be monitored and manipulated after successful verification from the smartphone application.

**Using Technologies:** C#, MySQL, SQLite and Various frameworks

1. **Smartphone Application**

Enable the user to control the house environment from the outside. Acts as a security and authority granting interface, the controls of the applications can be activated through voice.

**Using Technologies:** Android, Ionic, SQLite, Google Voice API and Various frameworks

1. **Device Driver Applications**

Maintains the control and communication between hardware components and software. These applications are directly embedded on the micro-controllers of each device.

**Using Technologies:** Arduino and C

## Hardware Development

Main focus lies in the development of the hardware components such as the micro-controllers of each device and a main hardware device that acts as communication relay to all devices connected to the system.

**Using Technologies:** Arduino, Various Electronic Components and Sensors

# Initial Project Plan

## Control Plan

**Stage One**

1. Determine the scope of the system to be developed.
2. Analyse the scope and determine necessary information.
3. Investigate products and technologies similar to the system to be developed.
4. Obtain necessary hardware and software components

**Stage Two**

1. Test and gain necessary knowledge of the hardware and software components.
2. Formulate sample schematics and designs for the hardware components.
3. Program the micro-controllers of each hardware component.
4. Formulate sample GUI designs of the software components.

**Stage Three**

1. Build and test the hardware component prototypes.
2. Design and build the GUI designs of the software components.
3. Start coding on the software components.
4. Start integrating hardware and software components.

**Stage Four**

1. Build and test software component prototypes.
2. Debug software and hardware component integration.
3. Re-evaluate the determined scope of the system.
4. Build and test complete prototypes of the system.

**Stage Five**

1. Compile the final report for the system.
2. Test and debug the completed system.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Stage | October | November | | December | | January | | February | | March | | April |
| **One** |  |  |  | |  | |  | |  | |  | |
| **Two** |  |  |  | |  | |  | |  | |  | |
| **Three** |  |  |  | |  | |  | |  | |  | |
| **Four** |  |  |  | |  | |  | |  | |  | |
| **Five** |  |  |  | |  | |  | |  | |  | |

## Communication Plan

Arrange supervisor meetings as necessary, planned review/feedback meetings will be held at the end of each stage in order to discuss the End-Stage report, the next Stage plan, and to review any technical deliverables produced during the stage. Feedback meetings will also be held following the submission of the two Interim reports.

# Initial Risk List

|  |  |
| --- | --- |
| Risk | Management Strategy |
| **Software** | Employ version controlling into the system. |
| **Hardware** | Have backup hardware components. |
| **Time Constraints** | Complete the system with less non-functional needs. |
| **Learning Technologies** | Simple prototypes will be built in stage two to understand and learns the technology. |

# Initial Quality Plan

|  |  |
| --- | --- |
| Check | Management Strategy |
| **Design Validation** | Check software and hardware interface design after completion of each prototype. |
| **Requirements** | Requirements will be checked after each stage and a thorough check will be done in stage 4 to ensure that they are correct, relevant complete, achievable and demonstrable. Prototyping and user interviews will be employed. |
| **Component Integration Quality** | To be conducted at the end of each prototype |
| **System validation and user acceptance** | To be conducted at the start of Stage 4 |