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Department of Computer Science

COS 730 Assignment 1

X10 Home Automation

Research X10 home automation

X10 is a communication protocol primarily used for home automation. Developed in 1974 by Pico Electronics [2], X10 was the first step to a practical illustration of home automation. It pioneered the field of home automation soon after its release. It basically enables electronic devices within a home to communicate with each other and the controllers through existing electrical wiring [1].

Communication Protocol: X10 operates on a simple and robust communication protocol. Commands are transmitted over the existing electrical wiring during zero crossings. When a command is sent, it is modulated onto the electrical power line at a 50/60 frequency and received by the intended X10-compatible device[3].

Devices: X10-compatible devices are installed in homes. These devices include light switches, lamp modules, appliance modules, motion sensors, security cameras, thermostats,etc[4]. Each X10 device has a unique address code that allows it to be identified and controlled individually or as part of a group[5].

Control Interfaces: Users can control X10 devices using various control interfaces, including [6]:

Remote Controls: allow users to send commands to X10 devices from anywhere within the home. Smartphones and Tablets: users can control X10 devices remotely over Wi-Fi or cellular networks that have a collaboration with the latest communication protocols. Computers: X10 software

applications running on computers provide advanced control and automation capabilities, allowing users to create schedules, macros, and customised automation routines.

Commands: X10 supports a variety of commands for controlling devices, including:

On/Off: Turn devices on or off remotely. Dim/Brighten: Adjust the brightness level of compatible lighting devices. All Lights On/Off: Simultaneously control all lights or devices in a specific group.

Timers: Schedule devices to turn on or off at specific times [6].

Macros: Create sequences of commands to automate complex tasks or scenarios[6].

Weaknesses contributed to x10 losing favour:

Interference: X10 communication can be susceptible to interference from other electrical devices and noise on the powerline, leading to reliability issues [7].

Range: X10's range may be limited by the quality of the electrical wiring in a home, and signal degradation over long distances can affect reliability [8].

Limited Bandwidth: X10's bandwidth is limited, which can restrict the number of devices that can be controlled simultaneously and the speed of communication [8].

Compatibility: Compatibility between different X10 devices and manufacturers may vary, leading to interoperability issues [8].

Lack of security: The doesn't have any encryption [8].

Low Performance: Due to range, bandwidth and interference [8].

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[4] x10,X10's ActiveHome™ Kit - Welcome to the 21st Century[online], Available:https://www.ipcf.org/article/1113/x10s-activehome-trade-kit-welcome-to-the-21st-century.html

[5] J Burroughs (Microchip technology Inc), (2010,May 1), X-10® Home Automation Using the PIC16F877A [Online], Available: https://ww1.microchip.com/downloads/en/AppNotes/00236B.pdf

[6] X10, What is x10 Home Automation [online], Available: https://www.x10.com/pages/allaboutx10

[7] "X10 devices and standards"[online], Available: http://www.x10.com.

[8] C. Withanage, R. Ashok, C. Yuen, K.N. Otto, "A Comparison of the Popular Home Automation Technologies",2014 IEEE Innovative Smart Grid Technologies - Asia (ISGT ASIA), Future Living Lab Engineering Product Development Pillar Singapore University of Technology and Design Singapore,2014,pp 3-4

2. Software requirements specification

Introduction User Characteristics User Story Functional Requirements Components Functions of each component Use case diagram Traceability Matrix Class/Component Domain model diagram High level non-functional requirements