(Saturn-Yellow) Blockchain Powered IR Remote Controllers

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Introduction

Have you ever lost the remote for your TV at home? Without the remote for the TV, you can't turn it on, adjust the volume or change the channel --the TV is essentially rendered useless. These complications become worse if you own a home theatre system. Home theatres include many different systems that work together, meaning different remotes for the sound, projector, lights and even perhaps the DVD player! With modern day technology and smart home automation, how can this problem be tackled??? Our solution is Blockchain Powered Universal Remote Control System – Smart IR.

How does this system work?

This system uses MQTT to configure multiple remote controllers on a shared WiFi network and employs Blockchain smart contracts to trigger signals via an IR transmitter. M5Core2 devices publish transaction data to a blockchain topic, which a Peripheral Gateway subscribes to. Upon receiving messages, the gateway signs the data and sends it to the blockchain network via HTTP. The Peripheral Gateway uses MQTT to communicate with the IR transmitter (also powered by an M5Core2) to transmit IR scan codes. Each remote controller has a customisable button layout for universal remote control, allowing different commands to be executed based on button presses and device orientation. An IR scan code receiver verifies accurate signal transmission and displays the results on PC software. This receiver can also map existing remote buttons to the universal controller. The system supports simultaneous operation of multiple controllers within the same WiFi networ. The system is designed ot use the NEC IR protocol. The images of the M5Core2 orientations show how all the different buttons can be configured and selected using orientation of the device. The image of the PC Gui represents how the controllers can be configured with custom configurations. Please see the block diagram for a clear description of this functionality.

Key Performance Indicators:

1. Remote controllers work, using M5Core2's, anywhere within 3-meter radius of the WiFi network (mobile hotspot) to create blockchain commands for execution and receive configuration updates over MQTT.
2. Commands are received by the transmitter M5Core2 to transmit a specified IR Code. The operation occurs within 2 seconds of button press from the remote controller.
3. Configure appliances by reading their existing scan codes using the IR receiver sensor, display this scan code onto a PC GUI, operation is 90% accurate at correctly reading scan codes.
4. Immutable logging present on Blockchain and able to be displayed on PC GUI and refreshed automatically to be displayed in 30 seconds following a button press.
5. Effective use of multiple controllers to control the same IR transmitter, use of orientation to select IR transmission options for different devices. Orientation change on M5Core2 touchscreen is sensed and changed within one second.

Conclusions to KPI's

1. Remote controllers are well able to work within 3-metre radius of WiFi network. The system successfully creates blockchain commands and receives the configuration update for multiple controllers over MQTT.
2. Transmitting IR scan codes following a button press occurs almost instantly, this KPI is well met.
3. IR receiver functionality is closer to 100% accurate. This criteria is well met.
4. Despite the considerable delay (due to Blockchain consensus algorithm), the immutable logging is present on the PC GUI within the time specified on the KPI.
5. Multiple controllers are able to control the same IR transmitter and select multiple appliances using its orientation. Orientation screen changes are almost instant.

Controller Layouts –

The controller layouts can be changed by rotating the device into the Up, Down, Left, Right positions. This is facilitated by an accelerometer sensor.

PC Software Layout –

The following image depicts the PC Software layout. For full details surrounding the network architecture, blockchain implementation and sensor integration please see the project wiki on GitHub.

The Smart IR software allows users to add IR appliance and configure up to 6 controls per appliance. Each control can be customised with a colour, label and IR Code. This IR code will then execute when the button is pressed on any of the Universal Controllers.

The software also features a blockchain powered parental controls suite and an activity log.

Additionally users, can use the IR Code scanning window to map existing NEC controllers into the software.

System Overview Diagram –