

# IoT Enabled Smart Television Control System for Children

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## Abstract

Now a days, television has become an integral part of daily life. Substantially Children are obsessed with cartoons, rhymes, and 3D pictures. Therefore, the use of long periods of TV viewing has a negative impact on their health, including optic nerve damage. Jitters that impair their vision and heighten their stress level without their knowledge causes headaches, etc. This proposed system will produce a smart app that covers and controls both biases and allows you to shoot parents and guardians can disable SMS announcements if they find them inconvenient. The bias automatically from anywhere at any time. The main ideal of this design is to give an IoT-enabled security system control over and long-time usage of TV. If the children use the TV for a long time automatically TV will be shut down by the parents with the help of blynk app. This design avoids the causes of health problems such as increased stress, neck pain and vision loss as well as the effects of optic jitters on the brain. This system aims to develop a prototype that's independent and capable of controlling television automatically via an Android smartphone using the Arduino UNO Microcontroller. If the children are sitting in front of the television within the distance limit from 20cm to 100 cm, the wi-fi module tracks the distance from the ultrasonic sensor. The tracked signal from ultrasonic sensor is send to the Arduino microcontroller and microcontroller will turn off the screen of the television.

**Keyword:** blynk app, Wi-Fi-module, Arduino Uno, ultrasonic sensor

## 1 Introduction

The Television have become the part of our life in this 21st centuries. Mostly Children are obsessed with it and Using Television for long time affects their healthlike damaging the optical nerves that reduces their eye vision and increases the stresslevel without their knowledge causes headache etc. In this project using blynk app we can monitor and control the television and that enables automatic shut-down & send notification to parents and guardians. Iot can be described as connecting everyday objects like smart phones, internet televisions, sensors and actuators to the internet where the devices are intelligently linked together to enable new forms of communication amongst people and themselves. With the IoT concept various electronic devices like home appliances can be controlled via Bluetooth, internet, short message service (SMS) based, etc. Because of its development, now IoT has been implemented in various industries and cities to make life and work easier. This research uses a concept of IoT for the implementation of Smart Home with TV as an object. The system was developed without compromising the function of the TVitself, where the system was built separately and stand alone. Hardware that is developed is placed or taped around the TV power button which acts as an assistantto the TV owner to interact with the power button on the TV. In addition, with this system, the TV in a power off condition can be turned on and vice versa through pressing the button on the home smartphone Android app users.

## 2 Literature Review

Ranking Security of IoT-Based Smart Home Consumer Device[1] Manufacturers of smart home consumer devices like home theatres, music players, voice-based assistants, smart lighting, and security cameras have widely adopted the Internet of Things (IoT)

Smart Living Using Bluetooth-Based Android Smartphone With the development of modern technology and Android Smartphone, Smart Living is gradually changing people's life[2] Bluetooth technology, which aims to exchange data wirelessly in a short distance using short-wavelength radio transmissions.

Design Proposal for Smart TV Interface and Remote Controller[3] This study was conducted with the aim of redesigning the interface for smart TV development of digital technology and the emergence of personalized smart media. As a result, people are starting to use various platforms to watch videos, and TV is also trying to create and applying various digital technologies.

A case study on reducing children's screen time the project of screen free week[4]The current study aims to direct children to alternative activities within a week period by applying the project of screen free week to voluntary families.

An approach to smart home security system using Arduino[5]Recent advancements in the field of Internet of Things (IoT) have turned this area in one of the most promising research topics to bring innovative and useful technologies in the future. Solutions for a low-cost and efficient Home Automation model have always been a widely addressed problem; This study focuses on the architecture and design of wireless, flexible and inexpensive smart home system advanced temperature and humidity monitoring system. A prototype is designed, and tested on China Mobile Network, in 20 samples the prototype average time of response.

Smart-TV Security[6]

Modern home networks are becoming more and more complex with the integration of various types of interconnected smart devices, using networking technologies.

Testing of Smart TV Applications: Key Ingredients, Challenges and Proposed Solutions[7] Smart TV applications are software applications that have been designed to run on smart TVs which are televisions with integrated Internet features. Nowadays, the smart TVs are going to dominate the television market

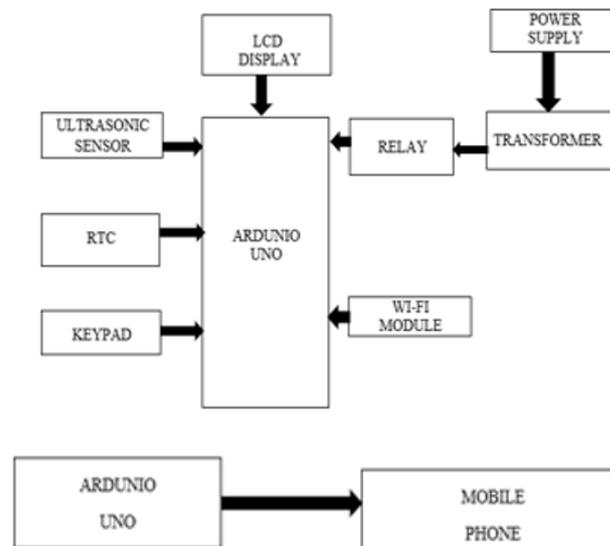
The Best Smart Home Security Systems for 2022[8] Nowadays, home automation becomes part of people's daily life. Many people aim to control their homes with a click on a smartphone but they are afraid to lose their confidentiality or personal data which can make a loss of security or even financial loss

Smart Home-Control and Monitoring System Using Smart Phone [9]. This paper presents a low cost and flexible home control and monitoring system using an embedded micro-web server, with IP connectivity for accessing and controlling devices and appliances remotely using Android based Smart phone app.

Smart Living Using Bluetooth-Based Android Smartphone With the development of modern technology and Android Smartphone, Smart Living is gradually changing people's life[10]

Bluetooth technology, which aims to exchange data wirelessly in a short distance using short-wavelength radio transmissions, is providing a necessary technology to create convenience, intelligence and controllability. for Smart Living.

### 3 Proposed System



**Fig 3.1 Block diagram of proposed system**

This proposed system demonstrates the design and implementation of a various sensors for the IOT Enabled Automatic Security Control System for Smart Television. This control system is powered by Arduino UNO microcontroller, it consists of LCD display module, 12v DC fan and Ultrasonic sensor, Wi-Fi module. Ultrasonic sensor is used to detect obstacles between television and object, if any interrupts occur between the limited range(2m). As a result, it sends messages to parents or guardians and the television can be able to shut down after instructed by the parents or guardians. This proposed system uses blynk app to monitor and control the television. Television and that enables to send SMS and voice notifications immediately to parents and guardians, they can turn off the devices automatically at over time usage and also when obstacles occurred between the particular range of distance (1m).

## 4 Hardware Description

### 4.1 Arduino Uno

The Arduino UNO is the microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs),6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSPheader, and a reset button.

It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver



**Figure 4.1 Arduino Board**

chip.

#### **Power USB:**

Arduino board can be powered by using the USB cable from computer. All the process need to connect the USB cable to the USB connection.

#### **Power (Barrel Jack):**

Arduino boards can be powered directly from the AC mains power supply by connecting it to the Barrel Jack.

#### **Voltage Regulator:**

The function of the voltage regulator is to control the voltage given to the Arduino board and stabilize the DC voltages used by the processor and other elements.

A voltage regulator generates a fixed output voltage of a preset magnitude that remains constant regardless of changes to its input voltage or load conditions. There are two types of voltage regulators: linear and switching

#### **Crystal Oscillator:**

The crystal oscillator helps Arduino in dealing with time issues. The number printed on top of the Arduino crystal is 16.000H9H. It tells us that the frequency is 16,000,000

#### **Arduino Reset:**

Arduino board should be reset to start the program from the beginning. UNO board reset can be done in two ways. First, by using the reset button on the board. Second, by connecting an external reset button to the Arduino pin labeled RESET.

#### **Pins (3.3, 5, GND, Vin):**

- 3.3V – Supply 3.3 output volt
- 5V – Supply 5 output volt
- Most of the components used with Arduino board work fine with 3.3 volt and 5 volts.
- GND (Ground) – There are several GND pins on the Arduino, any of which can be used to ground in circuit.
- Vin – This pin also can be used to power the Arduino board from an external power source, like AC mains power supply

#### **TX and RX LEDs:**

On the board, there are two labels: TX (transmit) and RX (receive). These appear in two places on the Arduino UNO board. First, at the digital pins 0 and 1 to indicate the pins responsible for serial communication. Second, the TX and RX LED. The TX LED flashes with different speed while sending the serial data. The speed of flashing depends on the baud rate used by the board. RX flashes during the receiving process.

### Digital I/O:

The Arduino UNO board has 14 digital I/O pins of which 6 provide PWM (PulseWidth Modulation) output. These pins can be configured to work as input digital pins to read logic values (0 or 1) or as digital output pins to drive different modules like LEDs, relays, etc. The pins labelled “~” can be used to generate PWM.

## 4.2 Ultrasonic Sensor

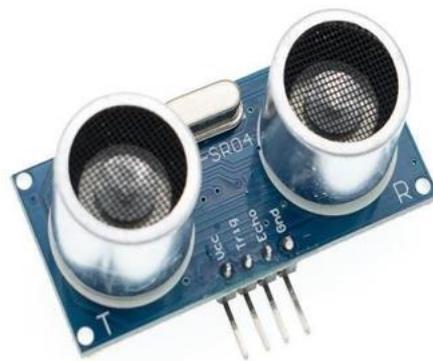


Figure 4.2 Ultrasonic Sensor

Ultrasonic Sensor Working Principle in industrial applications, an ultrasonic detection used to detect hidden tracks, discontinuities in metals, composites, plastics, ceramics, and for water level detection. For this purpose, the laws of physics which are indicating the propagation of sound waves through solid materials have been used since ultrasonic sensors using sound instead of light for detection. In this blog, we are going to learn about the ultrasonic sensor working principle and its applications.

## 4.3 LCD Display

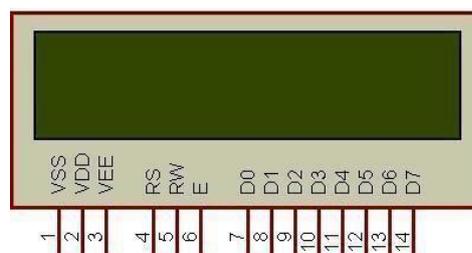


Figure 4.3 LCD Display

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels with the liquid crystal material sandwiched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed. Polymeric layers are present in between the electrodes and the liquid crystal, which allows the liquid crystal molecules to maintain a defined orientation angle. Polarizers are pasted outside the two glass panels, which rotate the light rays passing through them to a definite angle.

#### 4.4 RTC

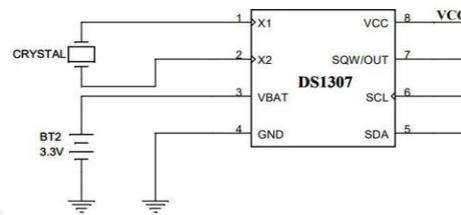


Figure 4.4 RTC

#### PIN Configuration

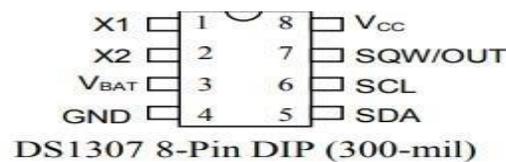


Figure 4.6 PIN Configuration

#### Description

The DS1307 Serial Real- Time Clock is a low- power, full double- enciphered numeric( BCD) clock/ calendar plus 56 bytes of NV SRAM. Address and data are transferred serially via a 2- line, bi-directional machine. The clock/ calendar provides seconds, minutes, hours, day, date, month, and time information. The end of the month date is automatically acclimated for months with smaller than 31 days, including corrections for vault time. The clock operates in either the 24- hour or 12- hour format with AM/ PM index. The DS1307 has a constructed- in power sense circuit that detects power failures and automatically switches to the battery supply

#### 4.5 Keypad

A computer keyboard's tiny, palm-sized seventeen-key numeric keypad, also known as the numpad or just the numpad, is typically located very far to the right. The numeric keypad is equipped with the digits 0 through 9, as well as the symbols for addition (+), subtraction (-), multiplication (\*), and division (/), a decimal point (.), Num Lock, and Enter. Many laptop keyboards lack a numpad, but you can still use the standard keyboard's keys as a numpad by pressing and holding the modifier key, which is usually spelled "Fn."A real numpad may fit on particularly large laptops (typically those with a 17-inch or larger screen) many businesses sell separate numpads that connect to the host laptop via a USB port.

#### 4.6 Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of connections in multiple contact forms, similar as make connections, break connections, or combinations thereof. Current flowing through the coil of the relay creates a magnetic field which attracts a switch and changes the switch connections. The coil current can be on or off so relays have two switch positions and these are double throw (transfiguration) switches. Relays allow one circuit to switch a alternate circuit which can be fully separate from the first. Relays are generally SPDT or DPDT but these can have numerous further sets of

switch connections, for illustration relays with 4 sets of changeover connections are readily available. utmost relays are designed for PCB mounting but the solder cables directly to the pins furnishing to take care to avoid melting the plastic case of the relay. The picture shows a working relay with its coil and switch connections. The switch on the left wing being attracted by captivation when the coil is switched on.

#### **4.7 Transformer**

Three phase transformers are used throughout industry to change values of three- phase voltage and current. Since three- phase power is the most common way in which power is produced, transmitted, and used, an understanding of how three phase transformer connections are made is essential. In this section it'll discuss different types of three phase transformers connections.

#### **4.8 Power Supply**

The AC voltage, generally 220V rms, is connected to a transformer, which steps that ac voltage down to the position of the asked dc output. A diode rectifier also provides a full-wave rectified voltage that's originally filtered by a simple capacitor filter to produce a dc voltage. This performing dc voltage generally has some ripple or ac voltage variations.

#### **4.9 WI-FI Module**

Wi-Fi module is developed by encapsulates Tensilica L106 integrates industry Clock speed support 80 MHz, 160 MHz, supports the RTOS, integrated Wi The module supports standard IEEE802.11 add modules to an being device networking, or erecting a separate network regulator. ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform It provides unequaled capability to bed Wi operation, with the smallest cost, and minimum space demand. Figure 1 ESP8266EX Block Diagram ESP8266EX offers a complete and tone or to discharge Wi- Fi networking functions from another operation processor When ESP8266EX hosts the operation, it thrills up directly from an external flash. In has better the performance of the system in similar operations. Alternatively, serving as a Wi- Fi appendage, wireless internet access can be added to any micro regulator grounded design with simple connectivity( SPI/ SDIO or I2C/ UART interface).

#### **ESP8266EX Block Diagram self-contained**

##### **Wi-Fi networking solution**

ESP8266EX Block Diagram self-contained Wi- Fi networking result It can be used to host Fi networking functions from another application processor. When ESP8266EX hosts the application, it thrills up directly from an external flash. In has integrated ameliorate the performance of the system in similar operations. Wi-Fi appendage, wireless internet access can be added to any micro regulator grounded design with simple connectivity( SPI/ SDIO or I2C/ UART interface). 3 core processor ESP8266 in lower sizes of the module bit MCU micro, with the 16- bit short mode,/ BB/ RF/ PA/ LNA, on- board antenna. b/ g/ n agreement, complete TCP/ IP protocol mound. Users can use the wireless SOCs, designed for space and power constrained mobile platform developers.

## **5 Software Description**

### **5.1 Arduino IDE**



**Figure 5.1 Arduino software**

Used to program the Arduino boards.

- This is an intertwined development terrain, developed by arduino.cc. Allow to write and upload law to Arduino boards.
- It consists of numerous libraries and a set of exemplifications of mini systems. Arduino software(IDE) is compatible with different operating systems and it supports the programming languages
- The Arduino software is easy to use for newcomers, or advanced druggies. It's used to get started with electronics programming and robotics, and make interactive prototypes.

## 5.2 Blynk



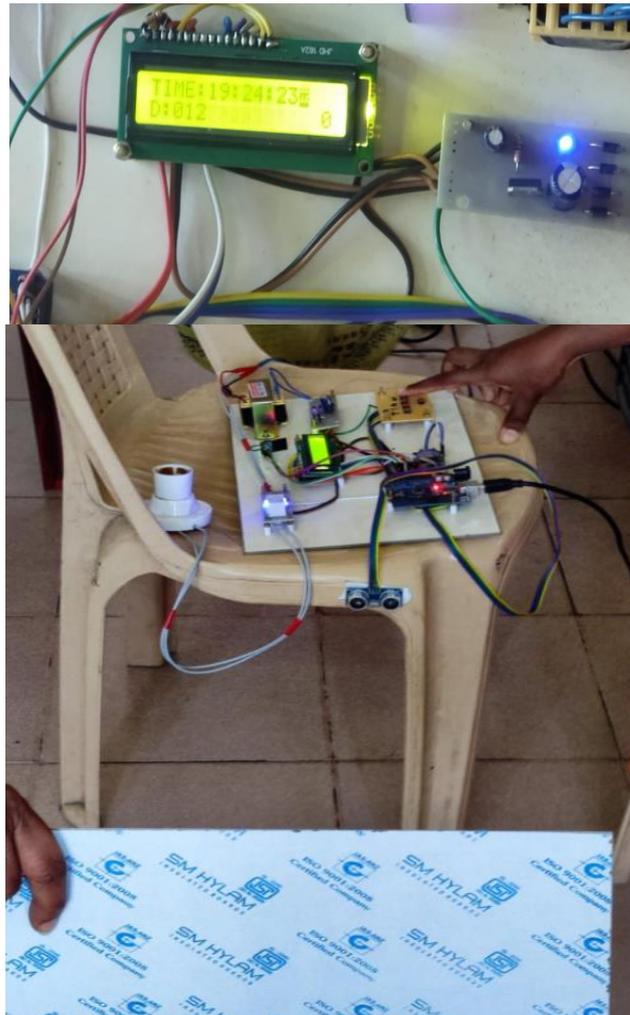
**Figure 5. 2 Blynk icon**

With Blynk, you can control an LED or TV from your mobile phone with literally zero programming. This is actually the first trial that I'll demonstrate in this course. But do not let this simplicity make you suppose that Blynk is only useful for trivial operations. Blynk is a robust and scalable tool that's used by potterers and the assiduity likewise. You can use it to cover the soil moisture of your vegetable and turn on the water, or open up your garage door, with your phone. You can also use it to control smart cabinetwork that can learn from your routines, or bed IoT and AI to traditional artificial products similar as a boiler, or for improving the integrity and safety. Blynk is free to use for particular use and prototyping. Their business model generates gains by dealing subscriptions to businesses that want to publish Blynk- powered

## 6 Results and Discussion

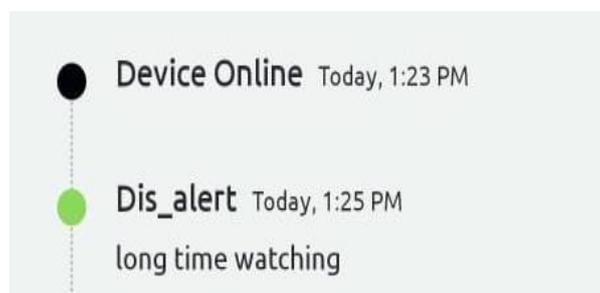


**Fig 6.1 Hardware setup of proposed system**



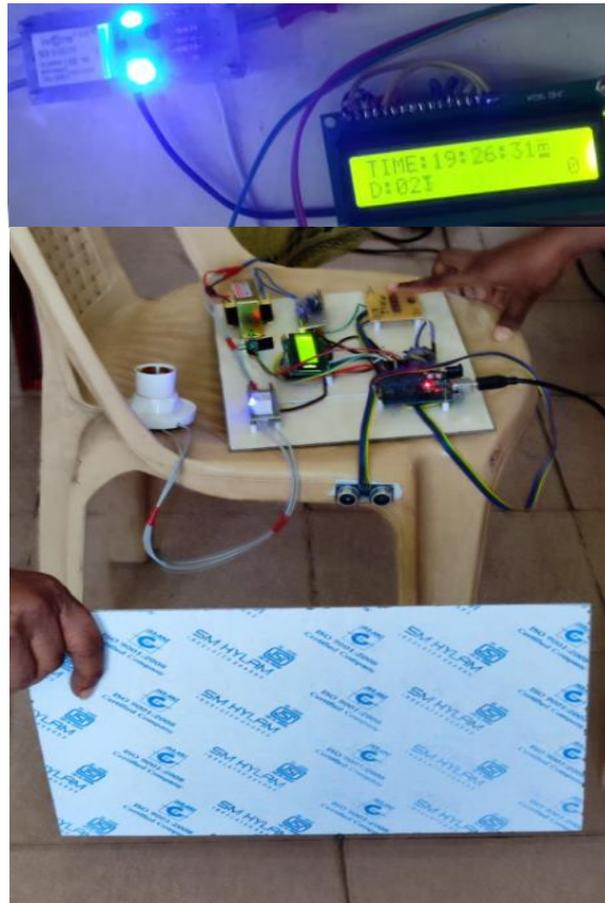
**Fig 6.2 real time data measured by Ultrasonic sensor range – indicates the child is sitting in 100cm in front of TV**

Fig 6.2 shows the distance measured by the ultrasonic sensor range is 100cm ie, Child is sitting in front of the TV and then screen of TV automatically Turned off



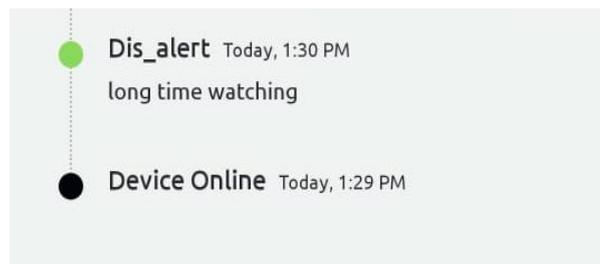
**Fig 6.3 Blynk app notification for parent-1**

Fig 6.3 shows that the children is watching the TV for a long time is notified to the parent's mobile through blynk app for turn off the TV



**Fig 6.4 real time data measured by Ultrasonic sensor range – indicates the child is sitting in 70cm in front of TV**

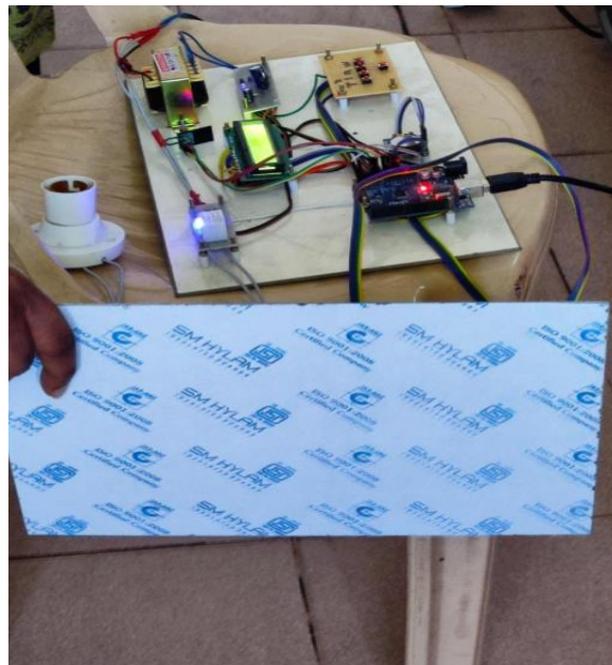
Fig 6.4 shows the distance measured by the ultrasonic sensor range is 70cm ie, Child is sitting in front of the TV and then screen of TV automatically Turned off



**Fig 6.5 Blynk app notification for parent-2**

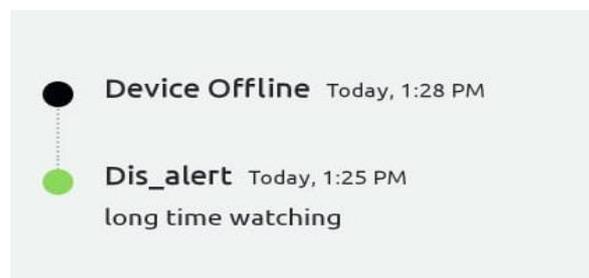
Fig 6.5 shows that the children is watching the TV for a long time is notified to the parents mobile through blynk app for turn off the TV





**Fig 6.6 real time data measured by Ultrasonic sensor range – indicates the child is sitting in 20cm in front of TV**

Fig 6.6 shows the distance measured by the ultrasonic sensor range is 20cm ie, Child is sitting in front of the TV and then screen of TV automatically Turned off



**Fig 6.7 Blynk app notification for parent-3**

Fig 6.7 shows that the children is watching the TV for a long time is notified to the parents mobile through blynk app for turn off the TV

## 7 Conclusion

In this project using blynk app user can monitor and control the television and that enables automatic shut-down & send notification to parents and guardians. The system is developed without compromising the function of the TV itself, where the system is built separately and stand alone.

It provides a IoT Enabled Security System to control over and longtime usage of Television and Automated shutdown of Smart Television. The use of Television for longtime affects their health like damaging the optical nerves that reduces their eye vision (asthenopia-eye discomfort, dimness of vision) and increases the stress level without their knowledge causes headache etc and this problem can be rectified by using this proposed project.

This system allows Children to limit screen time and over usage of television especially 3D and cartoon channels without break and it prevents from eye defects, sleep problems, chronic neck and back problems, depression and anxiety. Parents can able to switch off the television from anywhere using blynk app and implementation of this idea to control over usage

of mobile phones can be the future scope of this project.

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