# Smart Calendar using Raspberry pi

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**Abstract -** Time managing is the most essential skill for a student. From our experience, we find difficult to keep track on the homework, projects, quizzes, exams, ongoing events in the institution, percentage of attendance in each class, current affairs and even simple reminder. Using a traditional method of writing down on a book or using a specific application doesn't help much. Even teachers consume their valuable time in taking attendance manually on a book and also, they consume their time in updating students with the institution messages. Through the use of new technology, we are trying to develop a dashboard which acts as a calendar that has the capability to satisfy most of the needs for a student as well as for teachers. We hope that this project will have a higher chance of reaching most of the institution because of its effectiveness and being reasonably lower cost. The core goal of this project is to implement a screen for displaying our project inside every classroom to give students and teachers the ability to manage their daily tasks of the institution and even to get them updated about the upcoming works, ongoing news, sports, weather, attendance and many more. This project can keep the students to stay focused, entertained and even helps them in managing time.

**Keywords -** Internet of Things, Smart Calendar, Raspberry Pi, MagicMirror$^2$.

## I. INTRODUCTION

Generally, a calendar is a chart or a device that displays the date and day of the week of a particular year. It also updates about the days which is having holidays and festivals in a year. With respect to student life, an old traditional calendar is just meant for knowing about the particular date and day and about holidays and festivals. It doesn't help a student for progressing in any work. The project which we developed, named "Smart calendar", helps students as well as teachers by making the classroom a better place for the progress of children by its smart features [1]. Our smart calendar acts as a dashboard that updates every student and teacher about the current date, day and time. It reminds about the upcoming events in the institution and about the upcoming holidays. It reminds the students about the assignments by displaying the date, day and the topic of the assignment. It rings a bell after each class and updates the students about the next class by displaying the teacher's name and subject name of the upcoming class. As soon as the teacher takes her class attendance, it will get updated in our smart calendar which helps the student to track their attendance and reduces the work of a teacher of updating the student about their attendance in a particular class. Beyond academics, it also updates the teacher and students about the current news going on in the country and the world, updates about the current weather and live sports. If the teacher wants to show children a content that is present in their pc or mobile, they can connect their device with our smart calendar and can display what they want such as ppt, photos and videos. It is also capable of playing YouTube videos and songs for some entertainment purpose as education is a combination of academics, sports and even entertainment. Our project is made with the help of raspberry pi 3b+ which is a low-cost credit-card sized computer with its Debian buster software in which Magic Mirror software is installed for developing this project. The details about how this project is described in this report.

## II. PROBLEM DEFINITION

The proposed "Smart calendar" can be used to overcome the Realtime problems of the students and the teachers. We know that time managing is the most essential skill for the progress of a student, but most of the student fail in completing their works as they fail in managing time because they are not constantly reminded about their works. The teachers consume more of their teaching time inside classroom by taking attendance in an old traditional way and by updating the students about their attendance. They also consume more of their teaching time by informing the students about the institution messages and reminding them about assignments. Our project helps the students in managing time by reminding and updating them about their works and helps teachers to not consume more of their teaching time as it displays the institution messages and updates the students about their attendance and reminds about assignments.

## III. REQUIREMENTS

### *Hardware Requirements*

Raspberry Pi 3 Model B+, Micro SD card of minimum 32GB space, Monitor , HDMI cable and Micro USB charger (5v-2.5A), Mouse and keyboard, PC or laptop are required to perform this project. The detailed explanation about these products is given below [2].

*Raspberry Pi 3 Model B+:*

In this project we have used Raspberry Pi 3 model 3B+. The Raspberry Pi 3 Model B+ is one of the most popular Raspberry Pi made. It is the final version of the Raspberry Pi 3 range, boasting an updated 64-bit quad core processor running at 1.4GHz with built-in metal heatsink, 1GB LPDDR2 SDRAM, dual-band 2.4GHz and 5GHz wireless LAN (2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN), Bluetooth 4.2, BLE, faster (300mbps) Ethernet, extended 40-pin GPIO header, full-size HDMI port, 4 USB 2.0 ports, CSI camera port for connecting a Raspberry Pi camera, DSI display port for connecting a Raspberry Pi touchscreen display, 4-pole stereo output and composite video port, Micro SD port for loading operating system and storing data, 5V/2.5A DC power input and PoE capability via a separate PoE HAT [3].

*Micro SD card:*

It is a flash memory card that can be removable or detachable. It is sometimes also known as T-Flash. SanDisk invented microSD card. It is used to store data. It is commonly used with phones and other devices with storage capacities ranging from 128 Megabytes to 4 Gigabytes [4]. Some computers and laptops have SD card slot where the user can load data. If the computer or laptop is not having any slot then we can make use of SD card reader for reading SD card or to store some data in it. For this project we need at least 32GB memory card.

*Monitor:*

A computer monitor is an output device that is used to display information in pictorial or in text form. A monitor consists of many ports and the Raspberry Pi have to be connected to any of the supporting port to display the software in monitor [5]. A television can also be used instead of monitor.

*HDMI cable and Micro USB charger:*

High-Definition Multimedia Interface (HDMI) is an audio and video interface for transmitting uncompressed video data and compressed or uncompressed digital audio data to a monitor, television etc. Raspberry Pi 3b+ has a HDMI port for connecting to any display and the port differs for different versions of Raspberry pi. A charger of minimum 5V and 2A is required to power the Raspberry Pi [6]. The power port of Raspberry pi 3b+ is of micro-USB type and hence we need a charger which supports that port. The power port differs for different versions of Raspberry pi. A mobile charger can be used.

*Mouse and Keyboard:*

A mouse and keyboard is required which has to be connected to the USB ports of the Raspberry Pi for operating in it [7].

*PC or Laptop:*

A personal computer (PC) or laptop is required for installing the Raspberry Pi software in SD card through Raspberry Pi imager.

*Software Requirements:*

Programming language: Python, Java script and CSS, SD card formatter, Raspberry Pi Imager, MagicMirror$^2$ are required to perform this project. The detailed explanation about these software's is given below.

*Programming language: Python, Java script and CSS:*

A basic knowledge of Python, Java script and CSS is required to work on this project.

*SD card formatter:*

A SD card formatter software is required to be installed in the PC or laptop for formatting the SD card because when we install the Raspberry Pi software, the SD card must be completely empty.

*Raspberry Pi Imager:*

A Raspberry Pi Imager software is required to be installed in the PC or laptop for flashing the Raspberry Pi software to the SD card. The software that is flashed is "Debian buster with Desktop window". This software will be available inside the Raspberry Pi Imager itself [8].

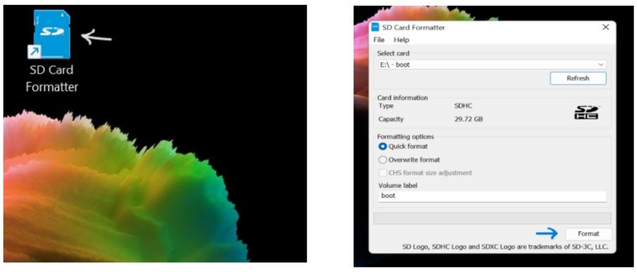
*MagicMirror$^2$ :*

MagicMirror$^2$ is an open-source modular smart mirror platform. With a growing list of installable modules, the MagicMirror$^2$ allows you to convert your hallway or bathroom mirror into your personal assistant. MagicMirror$^2$ focuses on modular plugin system and uses electron as an application wrapper. This software is used to create a smart mirror but we have used this software to create smart calendar.

## IV. IMPLEMENTATION

*Format SD Card*

Take a micro-SD card of minimum 32GB. Insert the SD card to the PC or Laptop with help of a card reader. When it is connected, open the SD card formatter application and perform a quick format as show in Fig 1.



SD Card Formatter

File Help

Select card

E:\ - boot

Refresh

Card information

Type SDHC

Capacity 29.72 GB

Formatting options

● Quick format

○ Overwrite format

□ CHS format size adjustment

Volume label

boot

Format

SD Logo, SDHC Logo and SDXC Logo are trademarks of SD-3C, LLC.

**Fig 1.** SD card formatter

*Flash Raspberry Pi Software*

Now reconnect the SD card to the PC through SD card reader and open the Raspberry Pi Imager application. Click on the "Choose OS", click "Raspberry Pi OS (other)" and select "Raspberry Pi OS (legacy)" [9]. Now click on the "Choose storage" and select the SD card and finally click on "write" and wait until it is written and verified as show in fig 2.

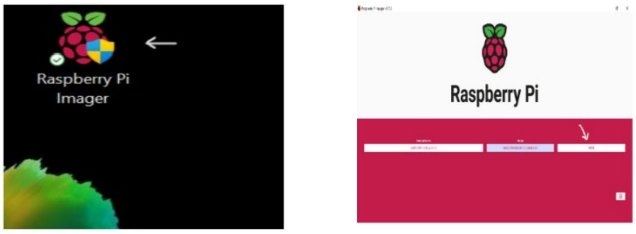


**Fig 2.** Raspberry Pi Imager

*Hardware Connection*

Connect the hardware components as shown in the fig 3.

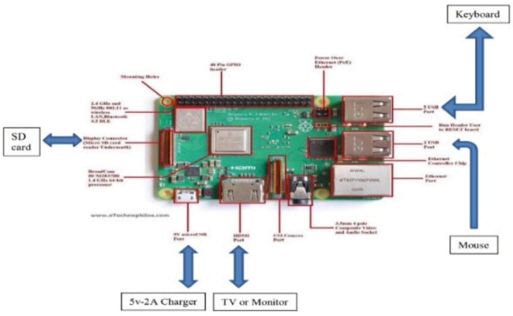

Keyboard
Mounting Holes
40 Pin GPIO header
Power Over Ethernet (PoE) Header
2.4 GHz and 5GHz 802.11 ac wireless LAN,Bluetooth 4.2 BLE
2 USB Port
Run Header Use to RESET board
SD card
Display Connector (Micro SD card reader Underneath)
2 USB Port
Ethernet Controller Chip
BroadCom BCM2837B0 1.4 GHz 64-bit processor
Ethernet Port
www.eTechnophiles.com
3.5mm 4 pole Composite Video and Audio Socket
5V microUSB Port
HDMI Port
CSI Camera Port
Mouse
5v-2A Charger
TV or Monitor

**Fig 3.** Hardware Connection

*Configure Raspberry Pi System*

Configure the Raspberry Pi by selecting the country, time region, and create a new password. Now connect the Raspberry Pi to the Wi-Fi network and update Raspberry Pi by installing updates. Then reboot the device to start with the new settings [10]. A desktop will be seen in the monitor as show in fig 4.

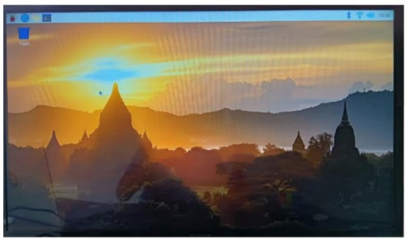
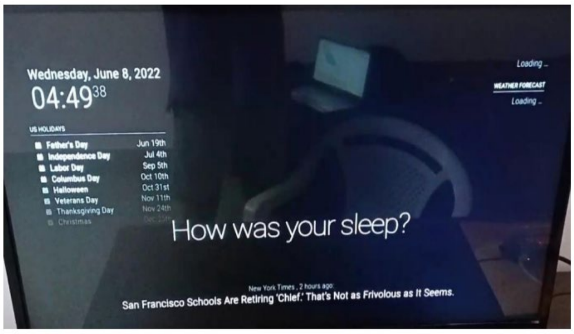


**Fig 4.** Raspberry Pi Desktop

*Install MagicMirror Software*

Click and open the terminal. Type the commands to install Magic Mirror software. After typing each command press enter and wait for the command to complete its running process. We can install the software by referring the installation guide in the Magic Mirror website. Once we completed the installation process and when we run the application by “npm run start” command. The default Magic Mirror portal will appear as show in fig 5.



Wednesday, June 8, 2022
04:49 38

US HOLIDAYS

| | |
|---|---|
| Father's Day | Jun 19th |
| Independence Day | Jul 4th |
| Labor Day | Sep 5th |
| Columbus Day | Oct 10th |
| Halloween | Oct 31st |
| Veterans Day | Nov 11th |
| Thanksgiving Day | Nov 24th |
| Christmas | Dec 25th |

Loading ...

WEATHER FORECAST

Loading ...

How was your sleep?

New York Times , 2 hours ago:
San Francisco Schools Are Retiring 'Chief.' That's Not as Frivolous as It Seems.

**Fig 5.** Default look of Magic Mirror

*Installing And Configuring Modules:*

In this step various modules will be installed and configured. There is a module named default which contains various other modules such as alert, calendar, clock, compliments, weather, newsfeed, and update notification. Let us configure these modules before installing the other modules.

*Module alert and update notification:*

Module alert sends an alert to the update notification module when there is problem in the system, for example “low power supply”. The update notification module, reads the alert and displays the issue message which helps the user to know about the issue in the system. Since there was no requirement of these modules in my project, We have removed these modules so that I can utilize the space of these modules for running other useful modules [11].

*Module calendar:*

Since the name of our project is “Smart calendar”, this is a very important module for this project. By default, there will be a US calendar which displays upcoming holidays of US. Since we need India’s calendar of holidays, we have to make changes in the configuration part of this module. To access the configuration file, we have to click on the file manager then have to click on MagicMirror folder. Inside this folder there will be a config folder. By opening this folder, we will find a file named “config.js”. This file contains the main program of the MagicMirror application. In this program let’s move to the module part and let’s find the calendar module. In calendar module we have make changes in the config part of the module. First, we have to remove the URL of the US calendar and have to replace it with the Indian calendar. For, that go to the calendar labs website by clicking this link www.calendarlabs.com and copy the URL of Indian calendar in .ics form and replace that with the Indian calendar. This change makes the calendar to display Indian holidays. Since our project should also update the assignments, upcoming exams, upcoming events of the institution, etc... we have to merge this calendar with our google calendar. For that, open your google calendar and open settings. Then allow permission for public to view your calendar. Then copy the public URL and add it to the config part of the calendar as shown below. Here we have even changed the header name and the position of the calendar as the way we wished it to be [3].

*Module clock:*

This module displays the date, day and time in 24hour format. Here we have changed the 24hour format to 12hour format and even have changed the position of the clock by making some changes in the config part of clock module.

*Module Compliments:*

This module displays some default compliments such as “How was your sleep?” and also capable of displaying the compliments which we give as input. This module wasn’t required for our project [6]. Hence, we have removed this module.

*Module weather:*

This module is capable of displaying current weather of the location we have specified and also capable of providing weather forecast of the upcoming days. For this we have to go to the open weather map website. In order to go to this website, click on the following link
http://bulk.openweathermap.org/sample/city.list.json.gz.

After opening this website, we have to create a free account with our mail id and have to select the location of which we want the details of current weather and weather forecast. In this project we have selected the location of our college for current weather and have selected Bangalore for weather forecast. After selecting the location, we have to copy the location ID and apikey that got generated with our account and have to add that in the config part of weather module as shown below. Here we are calling the weather module two times, one for current weather and another for weather forecast and even have set the position to top_left and have even made some changes in the location name of both current and weather forecast as per the location we have set [1].

*Module newsfeed:*
This module is capable of displaying live news from the news websites. By default, it will be displaying the news from the website “New York Times”. In this project we have even added the live news feeds from “Times of India” and “Hindu News Paper” [4]. For this we have to visit the following news websites and have to copy the RSS or CMS links and have to add it in the config part of the module newsfeed and even allowed the module to show news publish date and its source title.

Till now we have made changes in the default modules of MagicMirror. Now for installing additional modules, we have to go to the Magic Mirror website [7]. Here we have to install some third-party modules. The modules that we have installed for this project are MMM-network-signal, MMM-AlarmClock*,* iFrame, MMM-Screencast, MMM-CricketScores, and MMM-RandomPhoto.

*Module MMM-network-signal:*
This module displays a solid wifi logo as network signal for MagicMirror. It’s very important to know whether our device is actively connected to internet or not, and to know the strength of the signal for the project to work without any problems. So, we have installed this module and have made the code that to be added inside the program by going through the documentation in the MagicMirror website.

*Module MMM-AlarmClock:*
This module functions as an alarm clock. In this project we have used this module to act as a reminder bell after every class by displaying the timetable and the message that we have mentioned in the code. When it’s time, this module pops the particular message at that particular time with a bell. The code consists of days (Sunday to Monday) is represented from 0 to 6. Here we have to provide the alarm time in 24hour format.

*Module MMM-CricketScores:*
This module display's cricket scores for ongoing live cricket matches. Since our project is based on education purpose of students and as we know that education comprises sports, we have added a module which displays the live cricket scores. This module displays the live scores from livescore.com website. For getting the apikey of this website, we signed up in this website with our mail id. Click this link to visit this website https://www.livescore.com/en/cricket/. Then we logged in here https://rapidapi.com/apidojo/api/livescore6/ for getting our apikey. In the config part of this module, we have made this module to give importance to Indian cricket compared to other countries by giving the focus team as India. It displays the live scores of every country, but if Indian team is playing then it gives more importance in displaying India’s live scores. We have provided our apikey and have set the position to bottom left.

*Module MMM-Screencast:*
This is a module to cast YouTube to the MagicMirror. This is helpful for the teachers to show some useful educational content from YouTube to students by casting their YouTube to the device. We have changed the position to center and have changed the dimensions as per our project demanded. For casting YouTube, we have to open our YouTube and press that casting button and then have to select raspberry pi.

*Module MMM-RandomPhoto:*
This module will load a random photo from picsum. Originally by diego-vieira, and with support for local paths and NextCloud shares. By default, the background of MagicMirror is black, for this to look beautiful, we added this module which displays random beautiful background images, for enhancing the look of our project.
For this project we have kept the position to fullscreen and we wanted the image to change every 60 sec, so have kept update interval to 60 and kept opacity to 0.4.

*Module iFrame:*
It is a simple way to add an iFrame of any web content to your MagicMirror. In this project we have to display our google sheet which contains the attendance of each class. We have made ready our google sheet with all the formulas to count the attendance when taken by the teachers. As soon as the teacher takes attendance, the google sheet gets updated with the help of the formula that is given. Hence the link of this google sheet is pasted in the url section of this

module for displaying it. We have set the position to top right and have made changes in the width and height of the frame as per our choice. Here the height and width can be even given in the form of percentage.

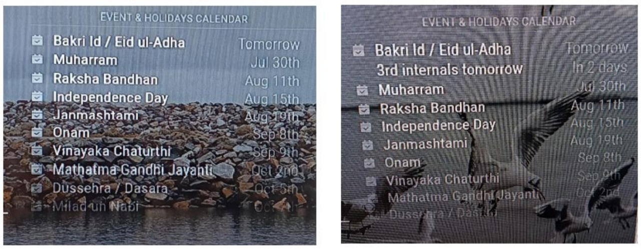
*Casting Photos And Videos Of Mobile:*
As said earlier we have to make our device capable of casting the photos and videos from our mobile. For that first click on the raspberry pi symbol on the desktop and click on preferences. Then click on Raspberry Pi Configuration. A window will open. Here go to interfaces and enable SHH and press ok. Now open the terminal window and type this command to install omxplayer and press enter. The command is: sudo apt-get install omxplayer. Now we have to install a library also. For that type the following command and press enter. The command is: sudo apt-get install libcurl. After this type the command "if config" and press enter. This command shows the ip address of the raspberry pi. Make note of this ip address. Now go to playstore in mobile and download an application named "Raspicast". Here type the ip address, username and password of the raspberry pi and click ok [11]. This will connect the application to the device. Now we can cast the photos and videos which is present in the mobile. This will help the teachers to display some educational content present in their mobile. This application will also allow to display YouTube videos.

*Connecting The Device With Mobile:*
Instead of connecting keyboard and mouse to the Raspberry Pi for making some modifications or for shutting down the system or for rebooting it etc. we can make the operations required by untouching the device. For this first enable SSH. Now download an application named "RaspController" in mobile and give the username, password and the ip address. Thus, through this application we can completely control the device through mobile which makes the work of the user easy.

## V. RESULT

*Module Wise Working Of The Model*

*Module calendar:*



EVENT & HOLIDAYS CALENDAR

| | |
|---|---|
| Bakri Id / Eid ul-Adha | Tomorrow |
| Muharram | Jul 30th |
| Raksha Bandhan | Aug 11th |
| Independence Day | Aug 15th |
| Janmashtami | Aug 19th |
| Onam | Sep 8th |
| Vinayaka Chaturthi | Sep 9th |
| Mathatma Gandhi Jayanti | Oct 2nd |
| Dussehra / Dasara | Oct 5th |
| Milad uh Nabi | [illegible] |

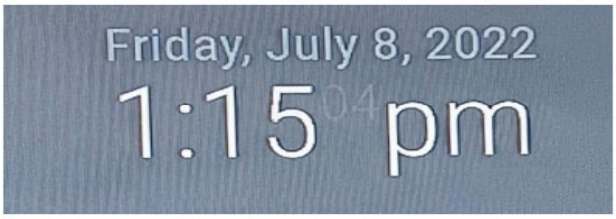
EVENT & HOLIDAYS CALENDAR

| | |
|---|---|
| Bakri Id / Eid ul-Adha | Tomorrow |
| 3rd internals tomorrow | In 2 days |
| Muharram | Jul 30th |
| Raksha Bandhan | Aug 11th |
| Independence Day | Aug 15th |
| Janmashtami | Aug 19th |
| Onam | Sep 8th |
| Vinayaka Chaturthi | Sep 9th |
| Mathatma Gandhi Jayanti | Oct 2nd |
| Dussehra / Dasara | |

**Fig 6.** Calendar

Here it is clearly seen that the calendar is displaying Indian holidays and when we updated about the exam in our google calendar, it got updated as shown in the above figure.

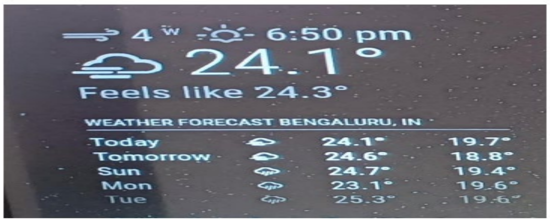
*Module Clock:*



Friday, July 8, 2022
1:15 04 pm

**Fig 7.** Clock

*Module Weather:*



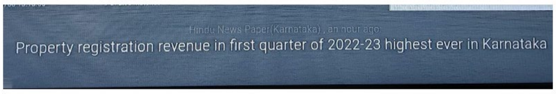
4 W 6:50 pm
24.1°
Feels like 24.3°

WEATHER FORECAST BENGALURU, IN

| | | | |
|---|---|---|---|
| Today | ☁ | 24.1° | 19.7° |
| Tomorrow | ☁ | 24.6° | 18.8° |
| Sun | 🌧 | 24.7° | 19.4° |
| Mon | 🌧 | 23.1° | 19.6° |
| Tue | 🌧 | 25.3° | 19.6° |

**Fig 8.** Weather

*Module Newsfeed:*



Hindu News Paper(Karnataka) , an hour ago

Property registration revenue in first quarter of 2022-23 highest ever in Karnataka

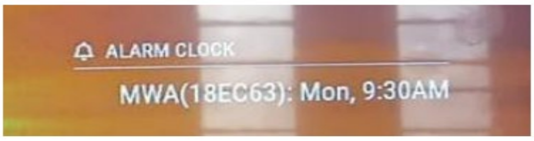
**Fig 9.** News

*Module Network-Signal:*

Excellent

**Fig 10.** Network

*Module Alarm Clock:*

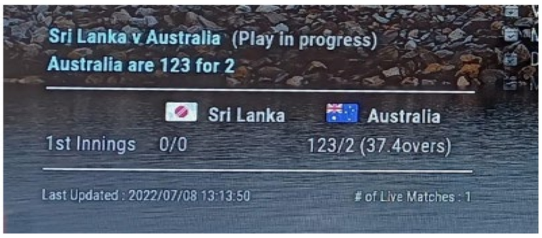


ALARM CLOCK

MWA(18EC63): Mon, 9:30AM

**Fig 11.** Alarm

*Module Cricketscores:*



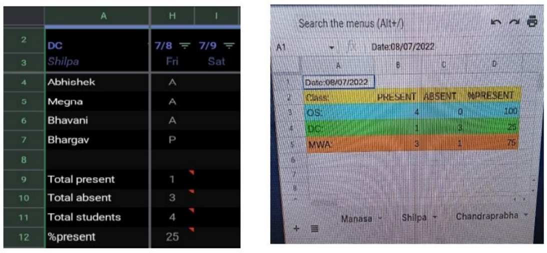
Sri Lanka v Australia (Play in progress)
Australia are 123 for 2

| | Sri Lanka | Australia |
|---|---|---|
| 1st Innings | 0/0 | 123/2 (37.4overs) |

Last Updated : 2022/07/08 13:13:50 — # of Live Matches : 1

**Fig 12.** Cricket Scores

*Module iframe:*



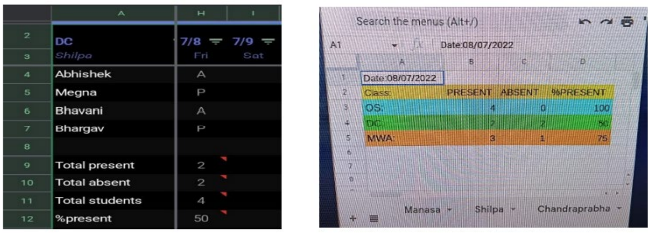
| | A | H | I |
|---|---|---|---|
| 2 | DC | 7/8 | 7/9 |
| 3 | Shilpa | Fri | Sat |
| 4 | Abhishek | A | |
| 5 | Megna | A | |
| 6 | Bhavani | A | |
| 7 | Bhargav | P | |
| 8 | | | |
| 9 | Total present | 1 | |
| 10 | Total absent | 3 | |
| 11 | Total students | 4 | |
| 12 | %present | 25 | |

Search the menus (Alt+/)

A1 Date:08/07/2022

| | A | B | C | D |
|---|---|---|---|---|
| 1 | Date:08/07/2022 | | | |
| 2 | Class: | PRESENT | ABSENT | %PRESENT |
| 3 | OS: | 4 | 0 | 100 |
| 4 | DC: | 1 | 3 | 25 |
| 5 | MWA: | 3 | 1 | 75 |

As we see in google sheet, the attendance of DC class is shown. The same have got updated and displayed in Smart calendar.



| | A | H | I |
|---|---|---|---|
| 2 | DC | 7/8 | 7/9 |
| 3 | Shilpa | Fri | Sat |
| 4 | Abhishek | A | |
| 5 | Megna | P | |
| 6 | Bhavani | A | |
| 7 | Bhargav | P | |
| 8 | | | |
| 9 | Total present | 2 | |
| 10 | Total absent | 2 | |
| 11 | Total students | 4 | |
| 12 | %present | 50 | |

Search the menus (Alt+/)

A1 Date:08/07/2022

| | A | B | C | D |
|---|---|---|---|---|
| 1 | Date:08/07/2022 | | | |
| 2 | Class: | PRESENT | ABSENT | %PRESENT |
| 3 | OS: | 4 | 0 | 100 |
| 4 | DC: | 2 | 2 | 50 |
| 5 | MWA: | 3 | 1 | 75 |

**Fig 13.** Attendance

Here we can see that as we made changes in the google sheet, the attendance got updated in the Smart calendar.

*Module Screencast:*

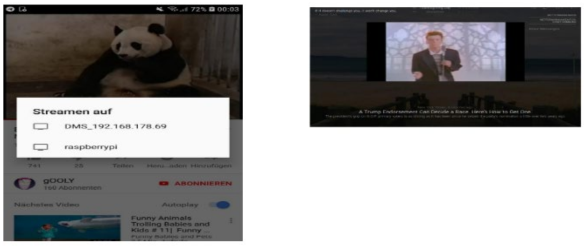


**Fig 14.** YouTube

By connecting raspberry through YouTube as shown above, we can cast YouTube videos.

*Raspicast and Raspcontroller:*

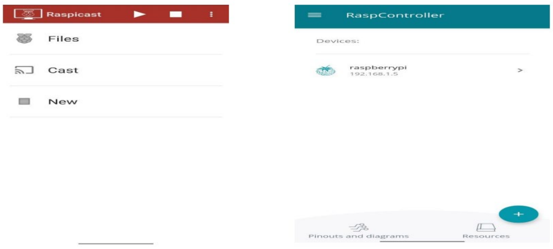


**Fig 15.** Raspicast and Rasp controller

Here we have shown the screenshots of Raspicast and RaspController which is used to operate Raspberry Pi.

*Over All Look Of The Model:*

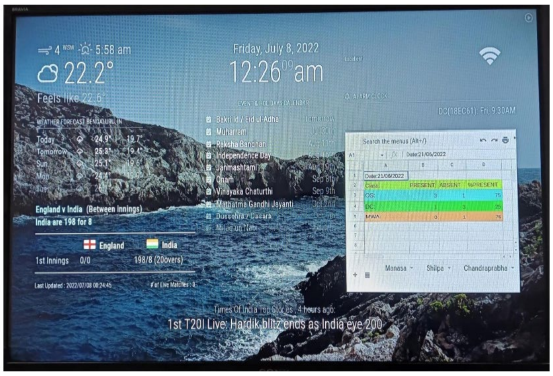

22.2°
5:58 am
Friday, July 8, 2022
12:26 am
England v India (Between innings)
India are 198 for 8
England
India
1st T20I Live: Hardik blitz ends as India eye 200

**Fig. 16.** Over all look of model

## VI. CONCLUSION

The main objective of the “Smart calendar” was to help students to manage their time, for students to understand the concept better with the videos shown by the teachers, for them to get updated about their attendance every time, for them to get updated about the upcoming events of the institution, for them to get updated about the assignments, for them to keep entertained with live news and sports and even to help teachers in terms of updating the institution messages and also for teachers to show some educational content through YouTube or by casting videos through mobile. From the results of the model, we can come to a conclusion that the proposed “Smart calendar” has performed very well and has a greater accuracy. Since the proposed model has greater accuracy, the “Smart calendar” can be implemented in every school and colleges, so that it would be a great help for students and teachers.

## VII. FUTURE ENHANCEMENT

For our project to be controlled through mobile, it requires more than one application, which is not preferred by most of the users. Hence, we can enhance this project by making it controllable by a single application. Furthermore, we can make this model capable to take attendance of the students through face reading and can even add more modules by creating more pages to display. We can even display the attendance in a better way by working on it.

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