MYiTOPS 2020

ss20_MK_MYiTOPS-robot-hand

DEVELOPMENT OF A FLEXIBLE IOT-BASED REMOTE-CONTROL FOR POWER TOOLS IN AN ALTITUDE SIMULATION CHAMBER (HAND ROBOT)

SPONSORED BY:

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Contents:

1. INTRODUCTION

The term Industry 4.0 stands for the industrial use of the Internet of Things in order to create networked, automated factories and value chains across company boundaries. Industrial production interlocks with the latest information and communication technology.
At the end of the MYiTOPS project, an intelligent control unit will be available that allows clients to intelligently control processes from anywhere in the world.

The MYiTOPS project took place in the summer semester 2020 in cooperation with the Karlsruhe University of Applied Sciences and the PAHANG University in Malaysia. The collaboration started with a visit from the Karlsruher students and lecturers at the partners in Malaysia.

The research is funded by the Baden-Württemberg Foundation. The cost of materials and equipment as well as human resources and travel were financed from the funds made available. The aim of the current project is to control and test STIHL products in the cold and altitude simulation chamber on the Bruchsal campus using IoT communication.

A system was developed that enables the control and evaluation of a gasoline-powered chainsaw quickly, easily and from anywhere using internet connection. The Raspberry Pi forms the central control unit of this system. The user controls the actuators for operating the motor via a user interface on a computer, smartphone or tablet. These devices communicate over the Internet with the Raspberry Pi, which then interacts with the test object via the hardware and software.

The individual components of this project were developed from home by the team members in Karlsruhe. Despite the adverse circumstances caused by CoVid19 during the entire process phase, the team was able to successfully complete the project.

All in all, this project is an educational, interesting and future-oriented experience for everyone involved, students and lecturers, which everyone will remember for a long time.

2. TEAM PRESENTATION

Figure 1: Team photo

2.1 Team Members:

1. Daria Masny-Kulak MECB (50675)
2. Muhammad Lujaini MECB (66997)
3. Jin Yun Ng MECB (66995)
4. Alyxie Anthony FZTB (66998)
5. Hussein Al-Faiz bin Mohamed FZTB (66994)
6. Jannick Ungerer MECB (61074)
7. Johannes Kessler MECB (60982)

2.2 Subgroups and division of tasks

	GROUP 1	GROUP 2	GROUP 3
MEMBERS	Edwin Daria	Jannick Alyxie Hussein	Jai Johannes
AREA OF RESPONSIBILITY	⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI(Interface)

Table 1: Subgroups

3. PROJECT HANDOVER PROTOCOL

3.1 Graphic representation of the entire system

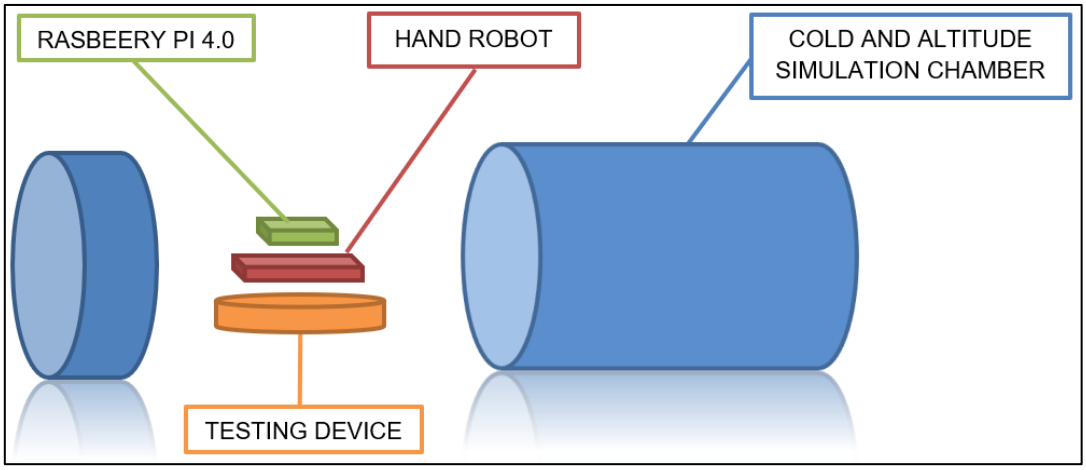

Figure 2: System overview

3.2 Description of the entire system at the handover

The project group WS 2019/20 has developed a system that enables the control and evaluation of a gasoline-powered chainsaw via the Internet. The Raspberry Pi forms the central control unit of this system. The user controls the actuators for operating the motor via a user interface on the computer, which communicates with the Raspberry Pi via the Internet. To monitor the engine, a sensor system was developed in order to record the speed and to receive regular feedback. The entire system was arranged on a wooden plate.

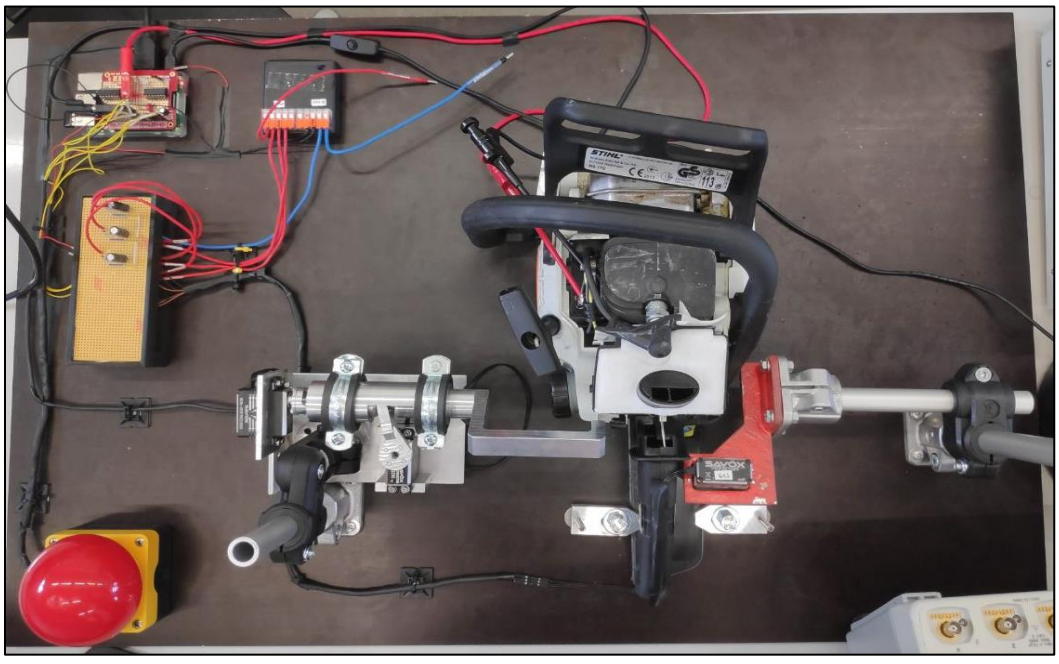

Figure 3: Structure of the hardware on the model plate

Data transfer:

As shown in figure 4, the data exchange was implemented using an external database in which the user sends all relevant information in defined tables. Feedback data is sent from the control unit to the server. Regular queries to the database result in constant data exchange between the control unit and the user interface.

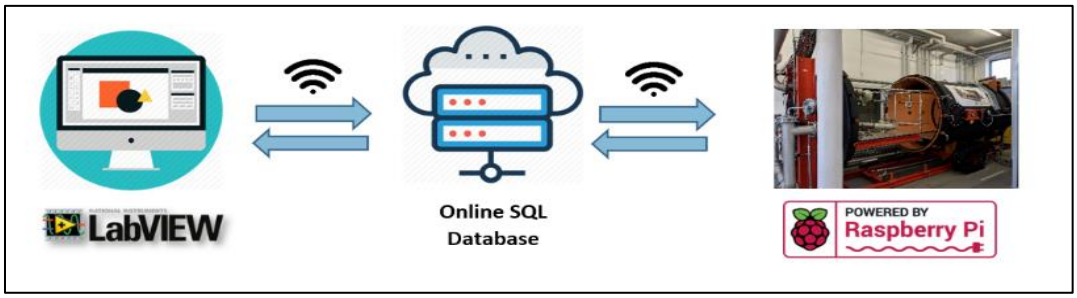

Figure 4: Data Exchange

4. PRODUCT DEVELOPMENT PHASE 1: DEFINE

4.1 Tasks

Prescribed tasks:

1. Literature survey, fundamentals
2. Understand and analyze reports and strategy of previous group
3. Bring equipment (chainsaw, hand robot components) in running condition
4. Requirements list
5. Budget List and Gantt chart, Team structure
6. Improvement of the system regarding:

    - Hardware, sensors, actuators, wiring, housing
    - Human Interface – GUI
    - Software
    - Connectivity
    - Fail-safe strategy and handling of the signal latency
    - Documentation and Presentation
    - Overall-Target: robust turn-key-solution

4.2 Requirements List

Team:

Muhammad Lujaini
Jin Yun Ng
Alyxie Anthony
Hussein Al-Faiz
Jannick Ungerer
Johannes Kessler
Daria Masny-Kulak

HOCHSCHULE KARLSRUHE
TECHNIK UND WIRTSCHAFT

Fakultät Maschinenbau Mechatronik

REQUIREMENTS LIST

DEVELOPMENT OF A FLEXIBLE IOT-BASED REMOTE-CONTROL FOR POWER TOOLS IN AN ALTITUDE SIMULATION CHAMBER (HAND ROBOT)

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Organisation Nr.	Organisation Editor	Process Kind	Process Phase	REQUIREMENTS	Value of condition Min.	Debit	Ideal	Unit
				Physical-Technical Funktion				
01	JK	N	PR	Measurement: equal/smaller than previous MYiTops	<1000			mm
02	JK	D	C	Programming of RPi	Python 3	Python 3	Python 3	Langu.
03	JK	D	P	Insert the layout for different devices of Stihl	3	3	3	Devices
04	JK	N	PR	Provide scematics, diagrams, utility information	1	1	1	Folder
				Communication				
11	JK	D	P	Lightweight internet protocol via Broker	MQTT	MQTT	MQTT	
12	JK	D	P	Setup of different motorprocesses	3	3	5	Settings
13	JK	W	P	Motorprocess data back to GUI/ User	1	1	1	RPM
14	JK	W	S	RPi using mobile internet connection / hotspot	GPRS	GPRS	3/4/5G	kBit/sec
				Mechanical/Electrical Components				
21	JK	N	PR	Raspberry Pi 4	1	1	1	PC
22	JK	N	S	Li-Po battery driven	2000	5000	5000	mAh
23	JK	W	S	Li-Po battery management system	1	1	1	Device
24	JK	N	PR	Clear arranged housing and wiring	1	1	1	Box
25	JK	N	S	Exchangeable actors	3	3	5	Plugs
				Ergonomics				
31	JK	D	PR	Key-Ready Solution				
32	JK	W	C	Central system start	1	1	1	Switch
33	JK	D	PR	Web socket interface	Browser	Browser	Browser	Appl.
34	JK	D	P	GUI design for universal user			Cayenne	SW
35	JK	D	P	Prevalence goal: product layout				
				Human-product relationship				
41	JK	N	C	Operation manual	1	1	1	Doc.
42	JK	W	PR	Design colours: black/white/orange (like chainsaw)				
43	JK	N	P	Emergency out for user-safety	1	1	1	Knob
44	JK	N	P	Handling of wrong entrys				

Kind of conditions: N - Necessary; D - Demand; W - Wish;
Kinds of Phase: P - Principle; C - Concept; S- Sketch; PR – Preparation

Figure 5: Requirements list I

Ausgabe vom 12.06.2020 Version 4 Ersetzt Ausgabe vom 04.05.2020 Version 3	Muhammad Lujaini - ML Jin Yun Ng - JYN Alyxie Anthony - AA Hussein Al-Faiz - HAF Jannick Ungerer - JU Johannes Kessler - JK Daria Masny-Kulak - DMK	

Figure 6: Requirements list II

4.3 Utility Analysis

	Selection of the most important evaluation criteria											to order: robot hand	
	Easy handling	Lifespan	Little need for space	Conectivity	Possibility of expansion des	Costs	Industrial standards	Weight	Reliability	Sustainability		The sum of the „+"	Weight factor
Easy handling	X	+	+	-	+	-	-	+	-	+		5	0,12
Lifespan	-	X	+	-	+	+	-	+	-	-		4	0,09
Little need for space	-	-	X	-	-	-	-	-	-	+		1	0,02
Conectivity	+	+	+	X	+	+	+	+	+	+		9	0,21
Possibility of expansion	-	-	+	-	X	+	-	+	-	+		4	0,09
Costs	-	-	+	-	-	X	-	+	-	+		3	0,07
Industrial standards	+	+	+	-	+	+	X	+	-	+		7	0,16
Weight	-	-	+	-	-	-	-	X	-	+		2	0,05
Reliability	+	+	+	-	+	+	+	+	X	+		8	0,19
Sustainability	-	-	-	-	-	-	-	-	-	X		0	0
									$\sum$ "+"			43	1
									$g_{Basis} = \frac{100\%}{\sum "+"} = 0{,}02$				
									Name: DM Date: 27.03.2020				

Table 2: Utility Analysis

4.4 Budget Plan

The Project was financially sponsored by Baden-Württemberg Stiftung with 1500€. In the Excel file below all costs are shown together. Despite the high quality of the parts, the limit was not reached.

No	Team	Komponente	Abmessungen (HxBxT)	Hersteller	Stückzahl	Kaufteil [ja/nein]	Shop	Bestellnummer	Kosten (netto)/ Stk	Kosten gesamt (netto)	Kosten gesamt (brutto)
1	alle	Raspberry 4 StarterKit			4	ja	Reichelt		90		360
2	Rpi	LiPo 7.4V 5500mAh 50C			1	ja	Conrad		31,99		31,99
3	Mech	3d Printer Filament			3	ja	Conrad		25,99		75
4	Electrical	Voltcraft LiPo Battery 3000 charger			1	ja	Conrad		25		25
5	Electrical	Step Down Voltage regulator			3	ja	eckstein		3,5		10,5
6	Mech	T-Nutenplatte 800 x 600 x 20mm	800 x 600 x 20mm		1	ja	vakuumtisch		500		500
7	Rpi	Rapoo 18177 Wireless Tastatur und Maus			3	ja	Saturn		25		75
8	alle	diverse Kleinteile			1	ja	divers		100		100
9	Rpi	Adapter from Hdmi to Dvi			5	ja	Reichelt		2,45		15
10	Group 1	Battery Management System	Chip	CN	1	ja	Banggod.com		2,00 €	2,00 €	2,00 €
11	Group 2	Step-Down Spannungsregler LM 2596	Chip	Geekcreit	1	ja	Banggod.com		3,24 €	3,24 €	5,00 €
12	Group 2	Kabelverschraubungen	-	Wiska	10	ja	Conrad.de		0,47 €	5 €	5,00 €
13	Group 2	Zylinderschrauben 20 mm	M3	Toolcraft	2	ja	Conrad.de		2,49 €	5 €	5,00 €
14	Group 2	Nutensteine für 10 mm Nuten	M8	Stritzelsberge	2	ja	Vakuumtisch.de		14,99 €	30 €	30 €
15	Group 2	Rundstecker	3-Polig	TRUcompone	3	ja	Conrad.de		8,57 €	25,71 €	30,00 €
16	Group 3	Step-Down Spannungsregler LM 317	Chip	QITA	1	ja	Conrad.de		4,42 €	5,00 €	5,00 €
17	Group 3	GPRS GSM Breakout-Modul	Chip	ARCELI	1	ja	Amazon.de		7,99 €	8,00 €	8,00 €
18	Group 2	Sechskantmuttern M3	M3	Toolcraft	2	ja	Conrad.de		1,49 €	2,98 €	3,00 €
										Gesamt	1.285,49 €

Figure 7: Budget Plan

4.5 Gantt Chart

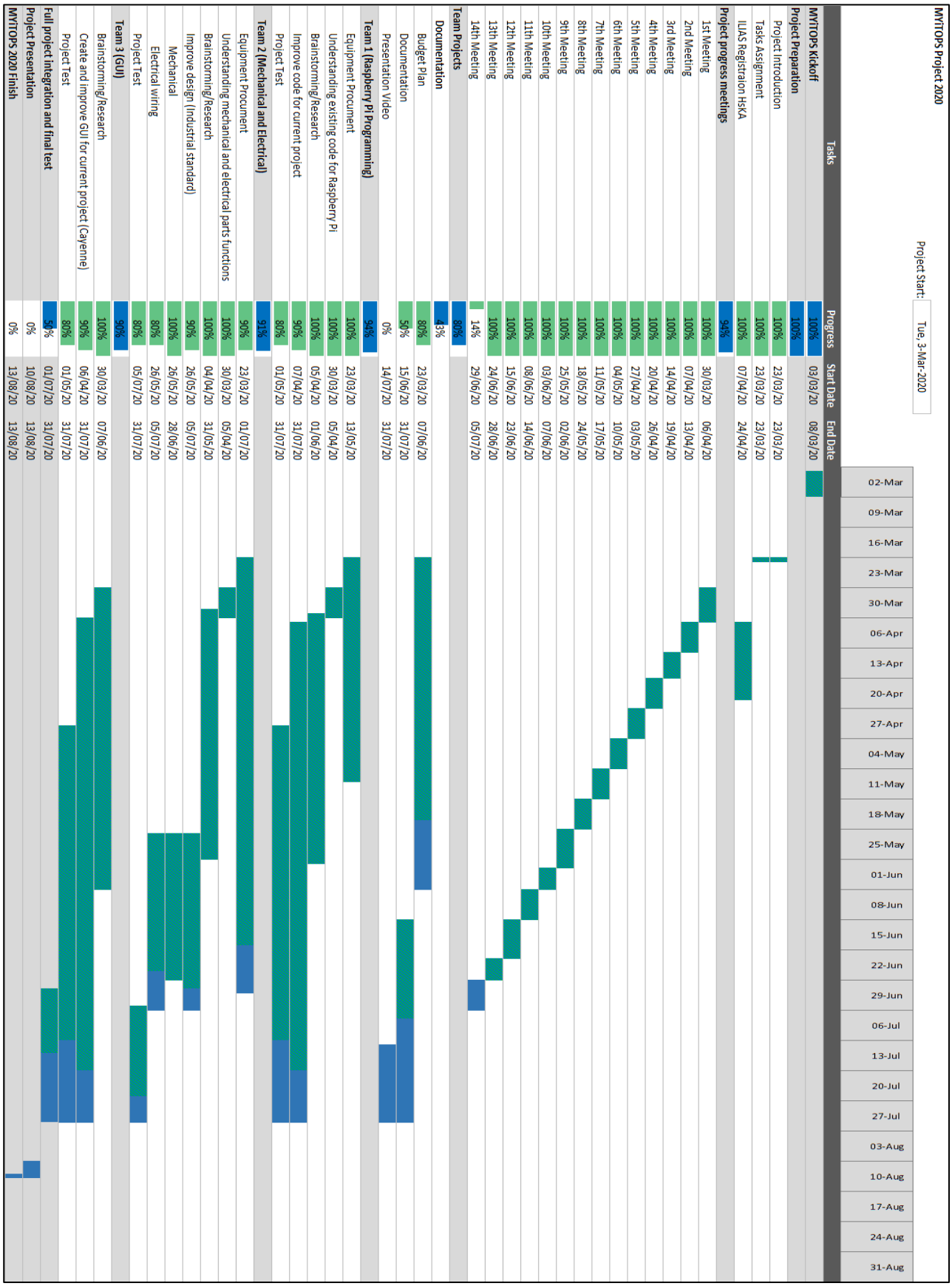


Figure 8: GANTT Chart

5. PRODUCT DEVELOPMENT PHASE 2: CONCEIVE

5.1 Internet of Things IoT / IoT Communication Protocols

The subject area *Internet of Things* (IoT) has become an integral and established part of today's world. Different systems, whether complex or simple, are now based on network-compatible embedded boards and therefore can also be accessed via internet. That means the IoT device can be accessed from anywhere.

In the Internet of Things, objects are given a unique identity and can communicate with each other or receive commands. In addition to the inter communication possibility of the devices (Machine - To - Machine - communication (M2M)), many of the networked objects offer an interface via the Internet where the devices can be operated and controlled by a user from any location.

MQTT stands for Message Queuing Telemetry Transport. It's a simple messaging protocol that uses the publish and subscribe method and was designed for restricted devices with low bandwidth, high latency or unreliable networks. The design principles are to minimize the network bandwidth and thereby reduce the volume of data. This protocol is ideal and suitable for the emerging M2M and IoT world of devices and for mobile applications where bandwidth and battery power are highly important.

There are two types of network entities in the MQTT protocol: A message broker and the customer. A MQTT broker is a server that receives all messages from clients and forwards them to the clients for whom they are intended. The publisher sends a message with the data to the connected broker. The broker then distributes the information to the subscribed customers on the subscribed topic.

To sum up, the MQTT is a publish- / subscribe messaging protocol, create for easy M2M communication and uses the client- / broker model. A client can be both: a publisher who publishes a message on a topic or even a subscriber to subscribe to a message.

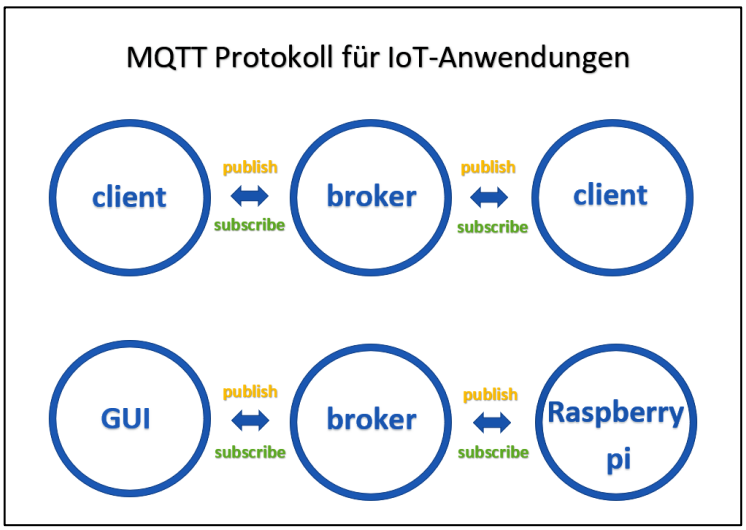


Figure 9: MQTT Protocol

Below the properties of the stable and mature MQTT protocol are shown:

- **Package Regardless ness:** the protocol can transport any type of data
- **Reliability:** has 3 QoS (Quality of Service) levels to ensure data delivery
- **Scalability:** publishing / subscribing to model scales is energy efficient
- **Asynchronous communication process:** the communication process between clients can be performed simultaneously without any interruption.
- **Bidirectional:** the customer can be both: publisher and subscriber at the same time
- **Cloud providers:** In addition, it is supported by huge cloud providers like Amazon, Google, and others.
- **Application**: Remote monitoring and - control

MQTT fulfills all requirements of this project.[1]

5.2 Graphical User Interface GUI

A graphical user interface (GUI) provides operating symbols to a user. With these, the user can interact with the program so that the functionalities of the program can easily be activated without ever having to deal with coding itself.

GUI requirements are:

- Visualization of operating data and system data of the Raspberry Pi
- Configuration / activation of the hardware interfaces
- Display and control of the GPIO pins
- Provision of a web-based remote desktop on the GUI of the Pi
- Linking the data read out by various sensors with actuators and expansion boards
- Representation of user-defined values (operating data, system data, sensor data)

One of the goals was to create a user-friendly and easy-to-create interface without complicated programming, on which the requirements of the MYiTOPS project were met.

When discussing an IOT platform, the Cayenne system was chosen. Its main features are very well in line with our project requirements. It is a drag-and-drop programming system that eliminates or bypasses the complexity and effort of many programming tasks. Cayenne works by a cloud Broker that stores the data. No *real* hardware-server (which could be damaged) is in use.

With the help of the Cayenne app or the Cayenne website, the user can easily control the functions and thus interact with the system.

The measured values of the sensors are logged simultaneously on the Cayenne cloud server and can be downloaded as an Excel file for inspection and further processed.

1 Danial-Haris-Bachelor-Thesis-Complete.pdf

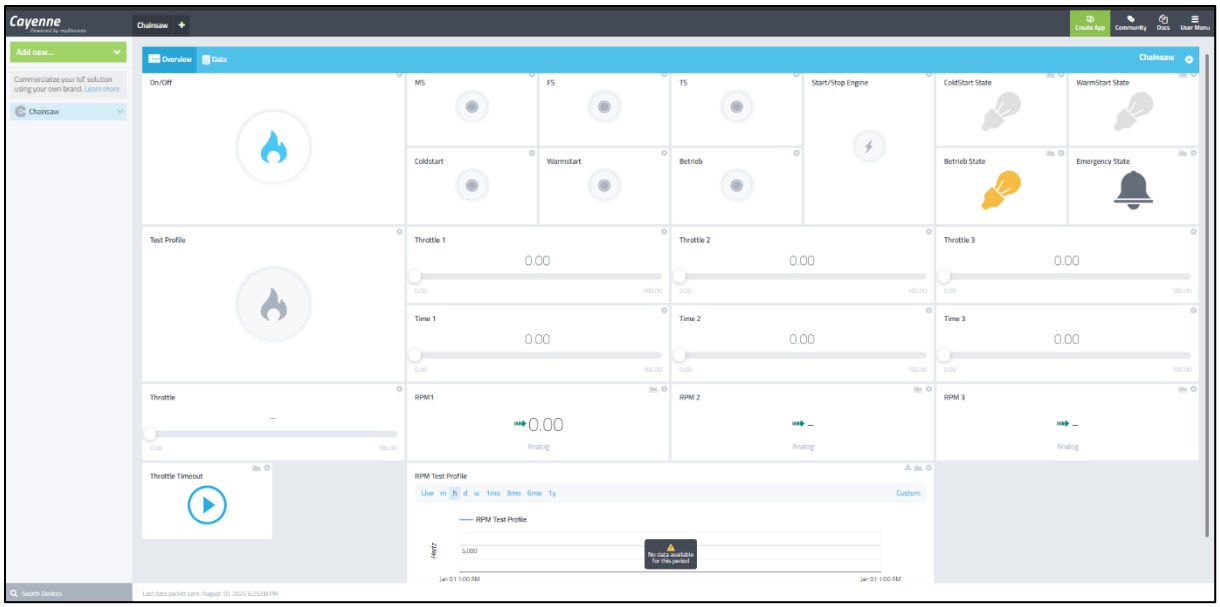


Figure 10: Online dashboard of Cayenne for MYiTOPS

Figure 10 shows the MYiTOPS dashboard on Cayenne online platform which consists of various widgets. The widgets that we are using for the project are controller widgets (buttons, sliders) and display widgets (2 state, value). These can be seen in figures 11 to 14.

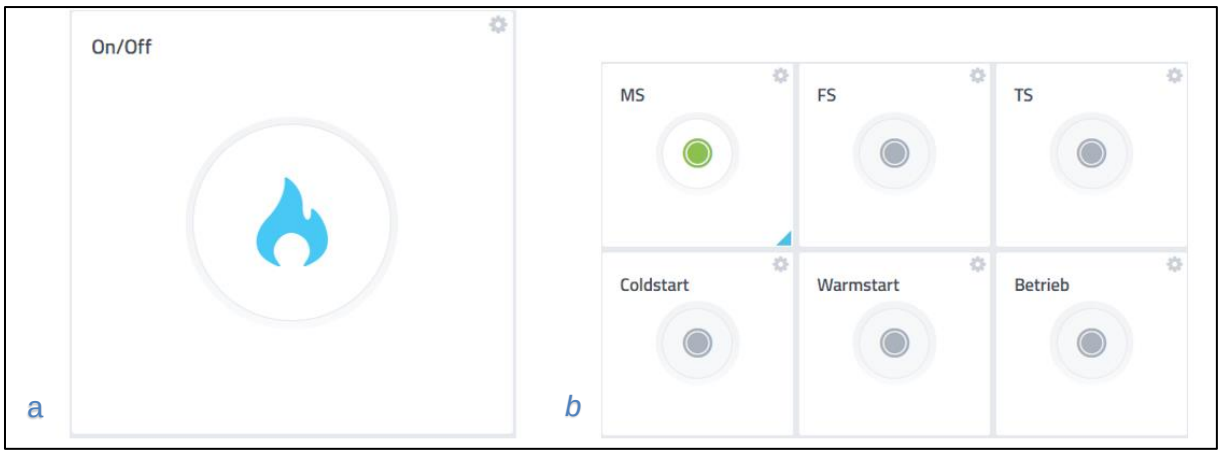


Figure 11 (a & b): Controller widgets with various types of buttons

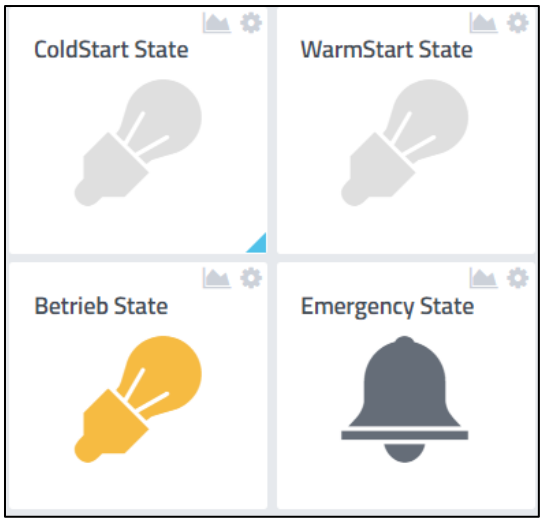


Figure 12: Display widgets with various types of state icons

Figure 13: Display widgets with value

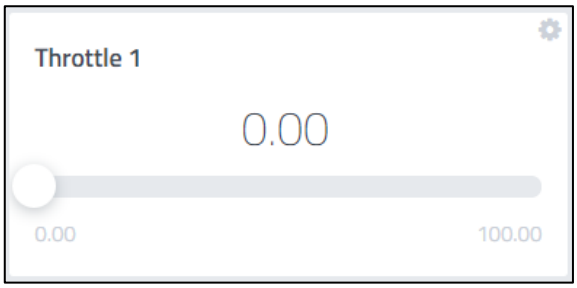


Figure 14: Controller widget with slider

Before proceeding to Python script, a MQTT library which is cayenne-MQTT has to be installed first to allow the communication between RPI and Cayenne IOT Broker. This can be done by using pip3 on the terminal of the RPI:

pip3 install cayenne-mqtt (for Python 3)

The MQTT username, password and client ID are required in the script to connect to the dashboard by running the script. It can be found on the configuration of the dashboard as shown in figure 15.

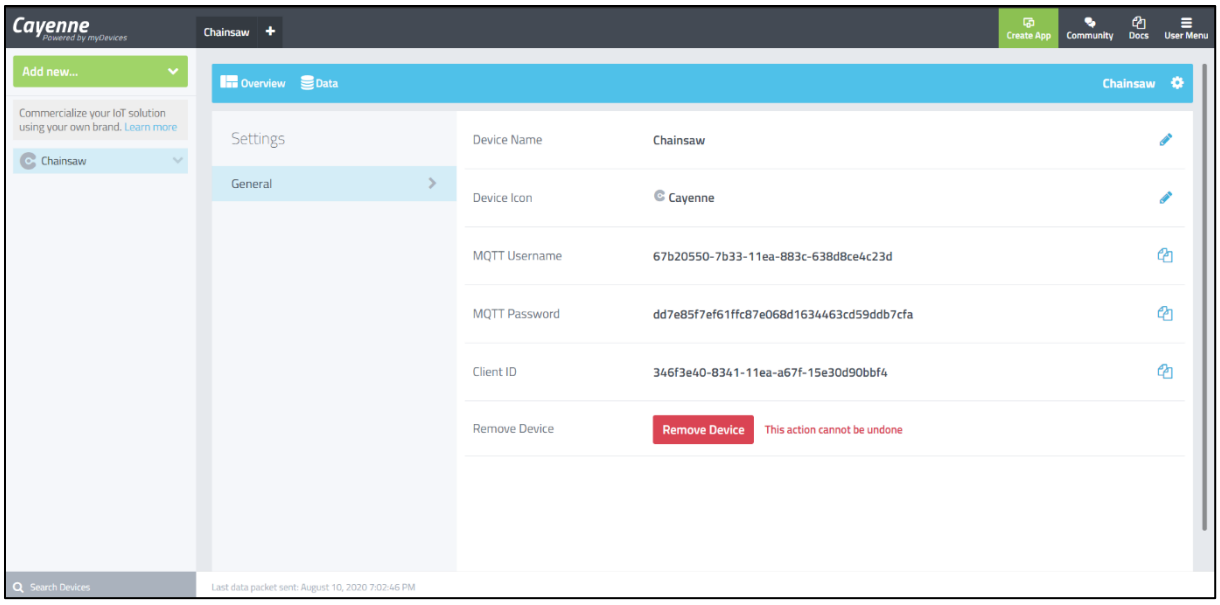


Figure 15: MQTT and Client details for the project

In case of passing data to Cayenne via MQTT, *virtualWrite()* statements can be used with the help of data type for Cayenne MQTT API which can be found on the Cayenne website to pass data to Cayenne. *VirtualWrite()* expects a parameter format like *virtualWrite(mqtt_channel_number, value, ''type value'', ''unit value'')*
which *mqtt_channel_number* is the channel number assigned to the widgets on dashboard. Value is the value that we want to pass to Cayenne. *Type value* is the type of values.
Unit value is the unit of the values that we want to pass [1].

For example, the states of *Betrieb* can be setup by sending different value parameters (“1” or “0”) to the Cayenne. *client.virtualWrite(20,1,”digital_sensor” , “d”)* is written in the code to light up the state.

Figure 16: Passing digital data to switch off on of the Betrieb states

Another example of passing data to the Cayenne that is required for the chainsaw project is the RPM value that is generated by the engine. In this case the analog value is passed. The value can be obtained by converting frequency of the engine to RPM and it is defined as *frequence_Reader.RPM*. The statement for passing the RPM value to the Cayenne dashboard is *client.virtualWrite(23, frequence_Reader.RPM, "analog_actuator", "null")* [2].

Besides passing data to the Cayenne, fetching data from the Cayenne is also important to control the conditions of the chainsaw. There are two methods that are used on Cayenne dashboard to fetch data

from Cayenne to Python which are buttons and sliders. Buttons are used to control the choke levels, start and stop the engine, etc. whereas sliders are used to set the values of throttle gas levels and time for the test profile. To get the data from the cayenne widgets, the channel of the buttons and sliders must be first declared in the coding. It can be written as *message.channel*. Next, *message.value* will be written to get the value from that channel. An example of getting the value from Betrieb button is shown below [3]:

```
elif message.channel==7:
  if message.value=="1":
     BetriebButton_Flag = True
  elif message.value=="0":
     BetriebButton_Flag = False
```

Here the channel is 7 as the widget channel on Cayenne dashboard is set as 7. When the button is pressed, the value is 1 and the *BetriebButton_Flag* flag true. When the button is turned off, the flag is false. This works the same on sliders to get their analog values. Table 2 shows the data type for Cayenne MQTT API on how to pass data to Cayenne via MQTT by writing these parameters on the coding. It also shows the channel numbers for each of the widget and the functions of the widgets.

Widget Name	**Channel**	**Data Type**	**Unit**	**Unit Value**	**Widgets**	**Functions**
On/Off	1	DA	Digital (0/1)	d	Button	Switch on to go to the main function of coding
MS	2	DA	Digital (0/1)	d	Button	Motorsäge Device
FS	3	DA	Digital (0/1)	d	Button	Freischeneider Device
TS	4	DA	Digital (0/1)	d	Button	Trennschleifer Device
Coldstart	5	DA	Digital (0/1)	d	Button	Switch on/off for cold start
Warmstart	6	DA	Digital (0/1)	d	Button	Switch on/off for warm start
Betrieb	7	DA	Digital (0/1)	d	Button	Switch on/off for betrieb
Aus	8	DA	Digital (0/1)	d	Button	Switch on/off for aus
Start/Stop Engine	9	DA	Digital (0/1)	d	Button	Switch on/off for engine
Test Profile	10	DA	Digital (0/1)	d	Button	Switch on/off to run the test profile

Shut Down	11	DA	Digital (0/1)	d	Button	Switch on to shut down RPI
Coldstart State	15	DS	Digital (0/1)	d	2State	Display cold start state
Warmstart State	16	DS	Digital (0/1)	d	2-State	Display warm start state
Betrieb State	17	DS	Digital (0/1)	d	2-State	Display betrieb state
Aus State	18	DS	Digital (0/1)	d	2-State	Display aus state
Emergency State	19	DS	Digital (0/1)	d	2-State	Display emergency state
Test Profile Timeout	20	DS	Digital (0/1)	d	2-State	Display timeout state for test profile
System Timeout	21	DS	Digital (0/1)	d	2-State	System restarts after 400 seconds
RPM 1	25	AS	Analog	null	value	Display RPM value for Time 1
RPM 2	26	AS	Analog	null	value	Display RPM value for Time 2
RPM 3	27	AS	Analog	null	value	Display RPM value for Time 3
Throttle	31	AA	Analog	null	Slider	Testing for the throttle servo without engine on
Throttle 1	32	AA	Analog	null	Slider	Set the value for Throttle 1
Throttle 2	33	AA	Analog	null	Slider	Set the value for Throttle 2
Throttle 3	34	AA	Analog	null	Slider	Set the value for Throttle 3
Time 1	35	AA	Analog	null	Slider	Set the value for Time 1
Time 2	36	AA	Analog	null	Slider	Set the value for Time 2

Time 3	37	AA	Analog	null	Slider	Set the value for Time 3
RPM Test Profile	40	GS	Rotation per minute	rpm	graph	Display the RPM data on the graph

Table 3: Data type for Cayenne MQTT API and the functions of the widgets

DA = Digital Actuator

DS = Digital Sensor

AA = Analog Actuator

AS = Analog Sensor

GS = Gyroscope

5.3 Test Profile

Due to the altitude levels of the mountain, it has great impact on the pressure and temperature when using the chainsaw on the mountain. Higher altitude results in lower density of air entering the carburettor, while the density of the fuel remains the same. This creates a progressively richer mixture that will not generate enough heat and an appreciable loss of power[4]. Therefore, RPM values from the engine will be calculated and displayed on the Cayenne to determine the optimum RPM of the chainsaw at different altitudes.

This can be done by constructing a test profile on the Cayenne to enable the user to adjust their desired values of throttle levels and time periods so that they can experiment what the optimum RPM values is for different altitudes. The test profile is shown in figure 17.

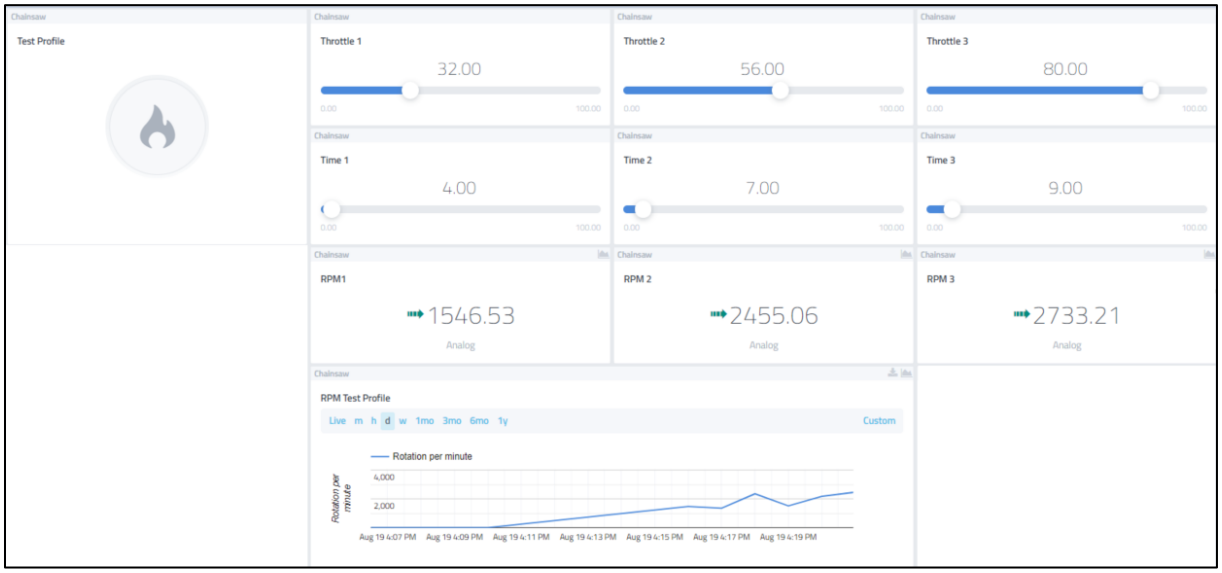
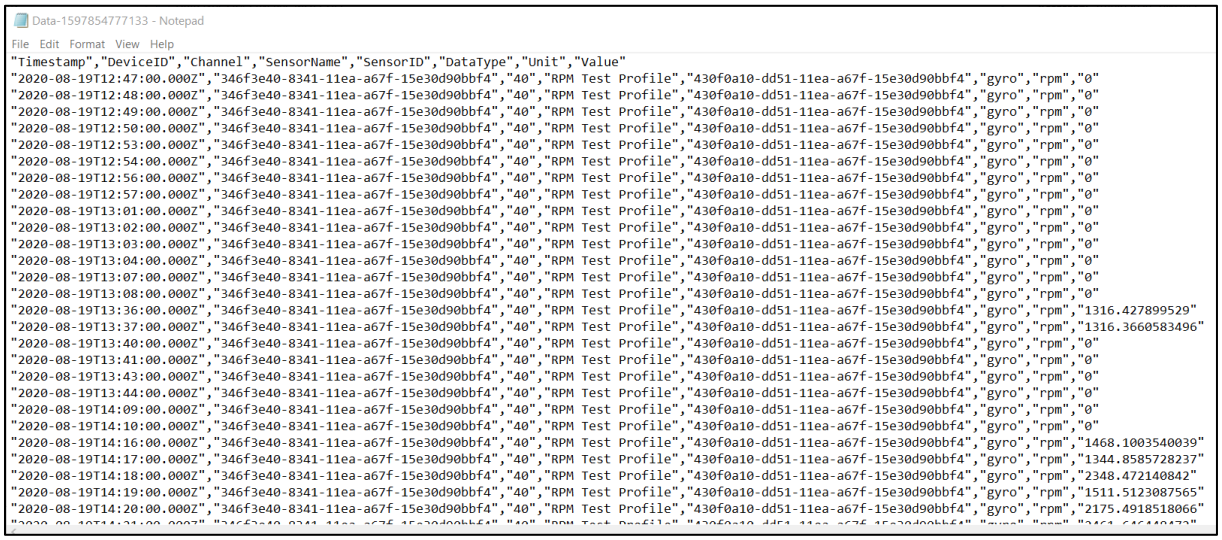


Figure 17: Test Profile on Cayenne Dashboard

Figure 17 shows 3 throttle sliders, 3 time sliders, 3 RPM values displays, a button for test profile and a graph. First, the user must determine the values for every throttle and time sliders and then switch on the button. While the chainsaw engine is running, the user can see the live RPM values updated live on the displays. The values will also be fetched from the script to display it as a graph. The user can repeat the test multiple times wants as long as the button is witched off and on again to run the profile.

Additionally, there are two methods to enable the user to view the data offline. Either the user can download it directly from the graph widget where the data is in the file type and can be viewed by using Notepad, which is shown in figure 18.



Data-1597854777133 - Notepad

File Edit Format View Help

```
"Timestamp","DeviceID","Channel","SensorName","SensorID","DataType","Unit","Value"
"2020-08-19T12:47:00.000Z","346f3e40-8341-11ea-a67f-15e30d90bbf4","40","RPM Test Profile","430f0a10-dd51-11ea-a67f-15e30d90bbf4","gyro","rpm","0"
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"2020-08-19T12:49:00.000Z","346f3e40-8341-11ea-a67f-15e30d90bbf4","40","RPM Test Profile","430f0a10-dd51-11ea-a67f-15e30d90bbf4","gyro","rpm","0"
"2020-08-19T12:50:00.000Z","346f3e40-8341-11ea-a67f-15e30d90bbf4","40","RPM Test Profile","430f0a10-dd51-11ea-a67f-15e30d90bbf4","gyro","rpm","0"
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"2020-08-19T12:56:00.000Z","346f3e40-8341-11ea-a67f-15e30d90bbf4","40","RPM Test Profile","430f0a10-dd51-11ea-a67f-15e30d90bbf4","gyro","rpm","0"
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"2020-08-19T13:03:00.000Z","346f3e40-8341-11ea-a67f-15e30d90bbf4","40","RPM Test Profile","430f0a10-dd51-11ea-a67f-15e30d90bbf4","gyro","rpm","0"
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"2020-08-19T13:07:00.000Z","346f3e40-8341-11ea-a67f-15e30d90bbf4","40","RPM Test Profile","430f0a10-dd51-11ea-a67f-15e30d90bbf4","gyro","rpm","0"
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"2020-08-19T14:10:00.000Z","346f3e40-8341-11ea-a67f-15e30d90bbf4","40","RPM Test Profile","430f0a10-dd51-11ea-a67f-15e30d90bbf4","gyro","rpm","0"
"2020-08-19T14:16:00.000Z","346f3e40-8341-11ea-a67f-15e30d90bbf4","40","RPM Test Profile","430f0a10-dd51-11ea-a67f-15e30d90bbf4","gyro","rpm","1468.1003540039"
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"2020-08-19T14:18:00.000Z","346f3e40-8341-11ea-a67f-15e30d90bbf4","40","RPM Test Profile","430f0a10-dd51-11ea-a67f-15e30d90bbf4","gyro","rpm","2348.472140842"
"2020-08-19T14:19:00.000Z","346f3e40-8341-11ea-a67f-15e30d90bbf4","40","RPM Test Profile","430f0a10-dd51-11ea-a67f-15e30d90bbf4","gyro","rpm","1511.5123087565"
"2020-08-19T14:20:00.000Z","346f3e40-8341-11ea-a67f-15e30d90bbf4","40","RPM Test Profile","430f0a10-dd51-11ea-a67f-15e30d90bbf4","gyro","rpm","2175.4918518066"
```

Figure 18: Data from the graph widget

While following the other method, the user can get the data from the Cayenne database but only those who have the access to the Cayenne main dashboard can get the data. It can be viewed either on the 'Data' tab on the Cayenne dashboard or in a downloaded Excel file. They are shown in figure 19 and 14 respectively.

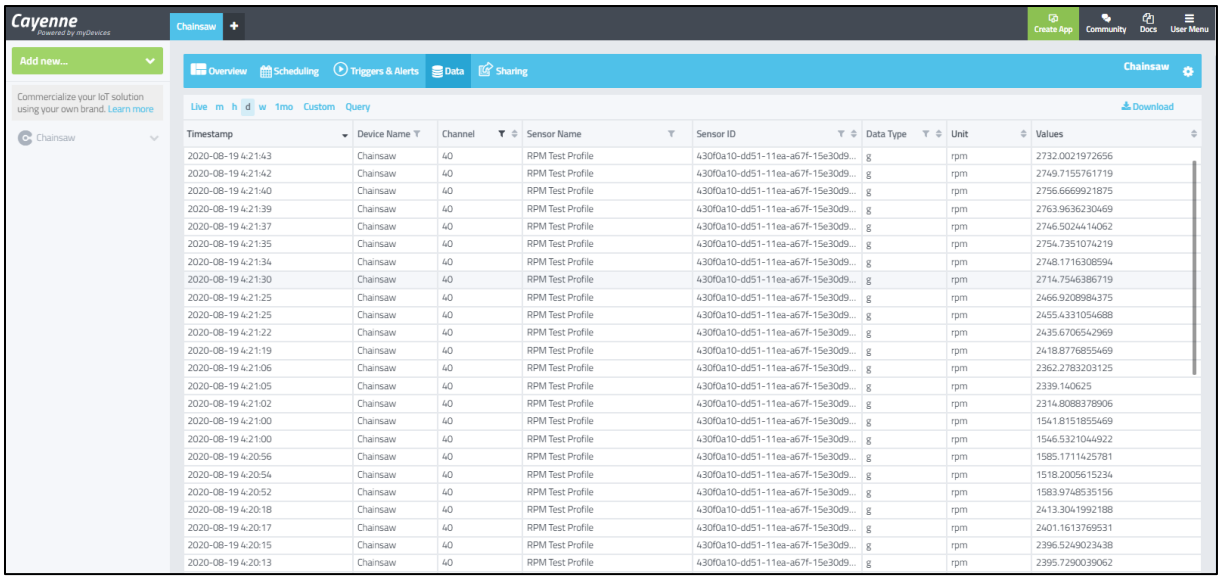


Figure 19: RPM data on Cayenne 'Data' tab

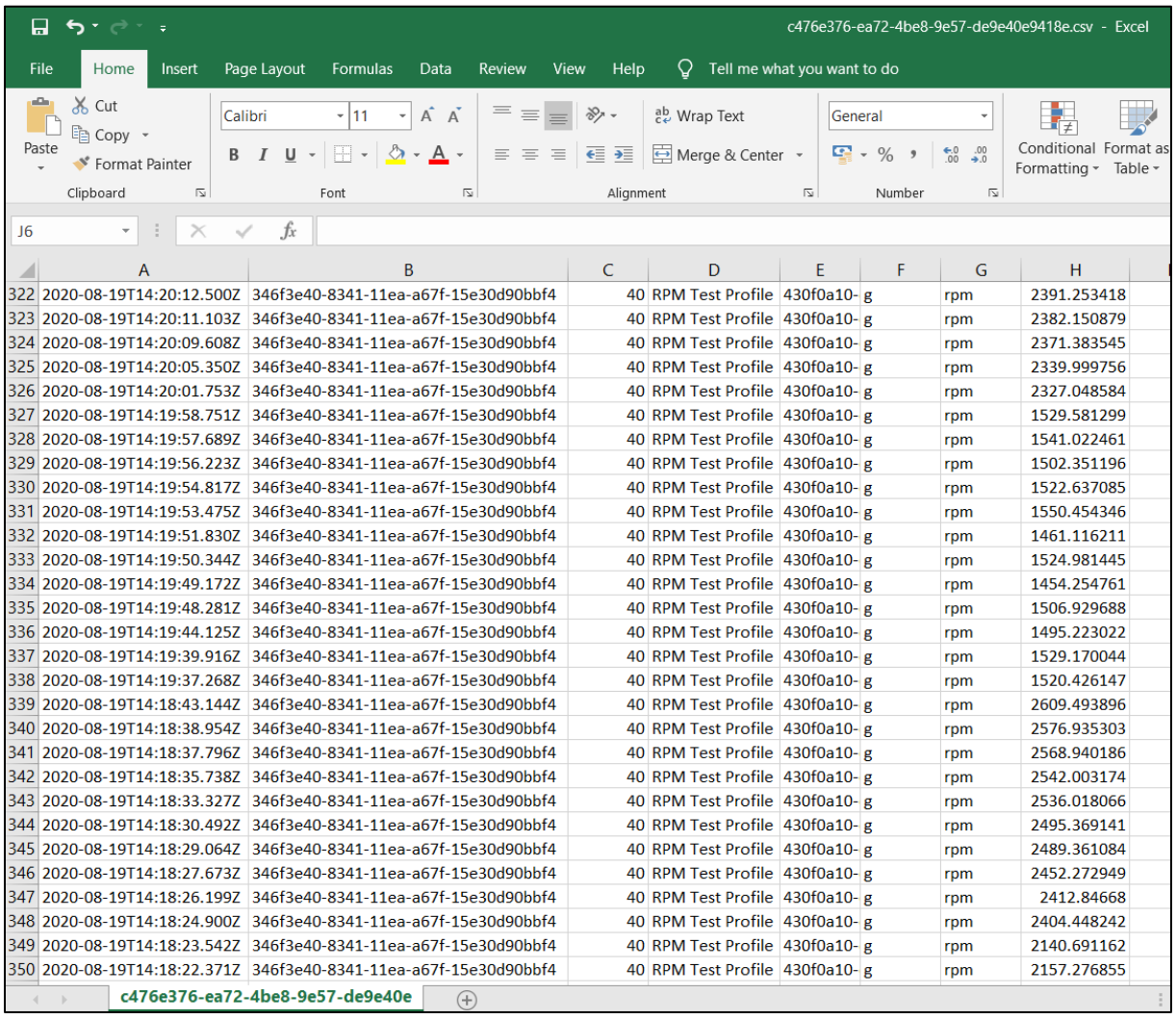


Figure 20: RPM data in Excel file

5.4 Program Flow

The best way to understand the Python script that runs at the Raspberry Pi is by using a program flow, as shown in figure 19. To ensure that the process flow can be read easily, waypoint *a*, symbolizes the linking point between the left and right process steams. When the user switches on the button to turn on the Raspberry Pi, the program will be executed automatically. After that a connection between the program and the Cayenne-MQTT will be established and the program will proceed with the main function.

Next, the relays will be switched on and the choke and gas servos will go back to their original positions. At this moment the script waits for the user to make changes on the Cayenne dashboard. When a button is pressed, the script continues to the next process where the desired positions of the choke and gas levels are controlled. Now the user can adjust the desired time and throttle values on the test profile to determine the optimum RPM value and the value will be stored in the Cayenne database.

In case the user wants to use the test profile again, the same procedure can be repeated until the user is done with testing. Finally, the user can switch off the Raspberry Pi by clicking the shutdown button on the dashboard. When the yellow light on the Pi is out, the button on the electrical box can be switched off.

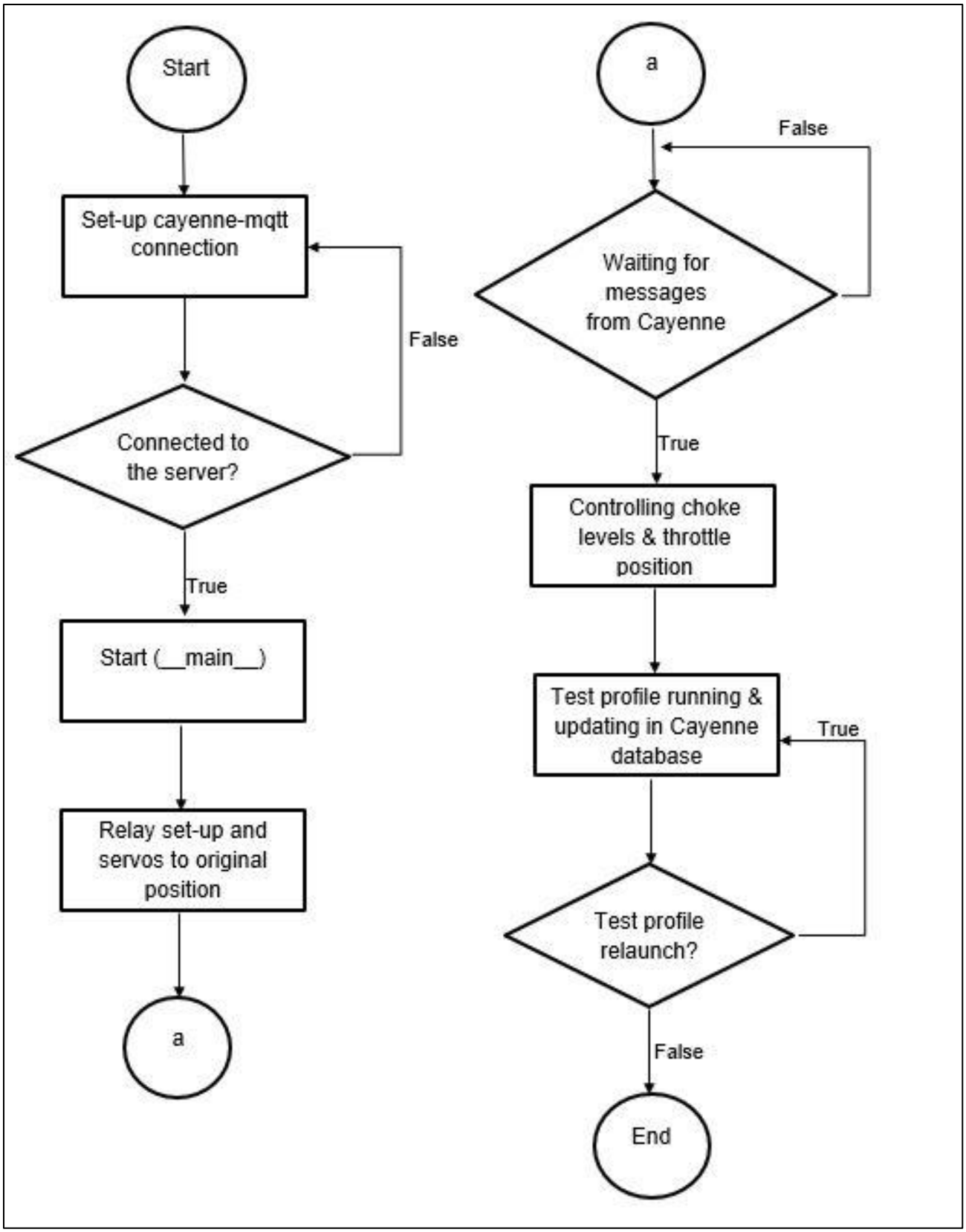


Figure 21: Program flow diagram

5.5 Hardware

Overview of the systems and parts which were taken over from previous groups:

- clamps for the different engines
- actor support mechanics with servos
- voltage supply of the servos by relay-module and capacitors
- emergency button
- RPM sensor clips and cables
- sensor signal processing chips

New arrangements:

For the previous goal *product-layout*, some reliable and stable parts were needed. Therefore, an Aluminium T-Nut plate as basis for the whole system and screwable servo cables called *Rundstecker* for easy exchange of actors were enclosed. The T-Nut plate uses special nuts and M8 threads for a fast screw off/on handling.

As the system must be user-friendly, the possibilities for changes are limited. Due to the support from Hochschule Karlsruhe, the usage of a 3D Printer was helpful as the whole electricity and most of the cables are built in housings and hide under printed covers. Most of the screws are standardize M3 threads. For safety in- and outlets cable glands are used. The ports of the Raspberry are reachable by openings on the sides.

By installing an LiPo-Battery, which must be voltage-stepped down from 7.4 Volts to 5 Volts for the controller and for the relay-module, it is simple to move e.g. to different workbenches or in- and out of the environment chamber. LiPo-Batteries have a good and efficient capacity and a high possible current, perfect for a modern microcontroller that needs high current during boot. The up to 600 times recharging cycles of the LiPo battery guarantees a long lifetime. A Battery-Management-System uses the acrylic topside of the housing to indicate the actual capacity of the LiPo Battery. The switch at the side of the housing starts the whole system.

The PiHAT from MYiTOPS 2019 is exchanged by a self-made *motherboard* to have more space for incoming changes and parts. A pi-cobbler to this motherboard is more stable against stress and vibrations. The sensor electronic for the RPM counter is added here as well. The parts and the schematic for this electronic is totally reused from MYiTOPS 2019.
By using screwable connectors and wire end ferrules, an easy disassembly and assembly is possible.

We presupposed WIFI, GPIO-Pins, fast processor, possibilities to expand and reliability to our microcontroller - the hat of the system.
By a recommendation of our supervisor Ferhat Aslan during the kick-off meeting in Malaysia, the decision to use the newest Raspberry Model 4B was made. This controller fulfils our requirements.

6. PRODUCT DEVELOPMENT PHASE 3: DESIGN

6.1 Electrical

For the electrical parts of the system, there are not many changes to the overall schematic diagram compared to the previous group. What has been done is that the circuit is rebuilt and added with components that serve the objective of our system to make it more *industrialized*. The table below shows the consideration that is taken on what to improve from the previous electrical parts.

No	Things that can be improved	Solution
1	Circuit wiring	Creating a new circuit wiring for the entire electrical component in single board.
2	Wiring Connection	Using proper connector and a waterproof wire socket for easier troubleshooting and upgrading.
3	Power supply	Dependant power supply for different component. Separated from the LiPo battery to two different power supply for the raspberry pi and the other one is to run the servo.

Table 4: Possible improvements

6.1.1 Circuit Wiring

In order to have a compact and robust system, the electrical parts must be centralized and standardized. This requirement gives us the idea to create a single board where the whole connection for the main and control circuit is placed. The figures below show the methods of electrical connection for the system (before and after).

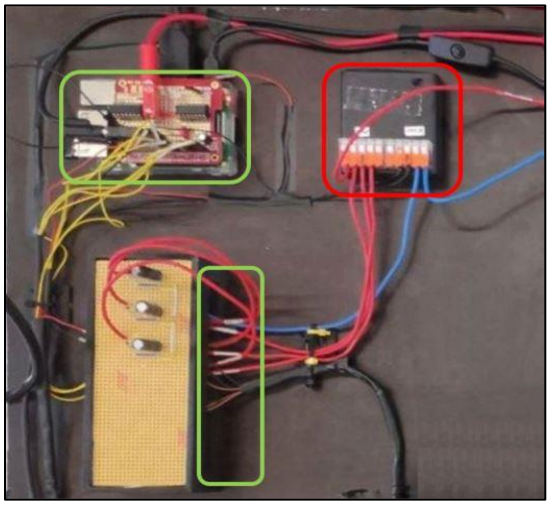


Figure 22: Old circuit

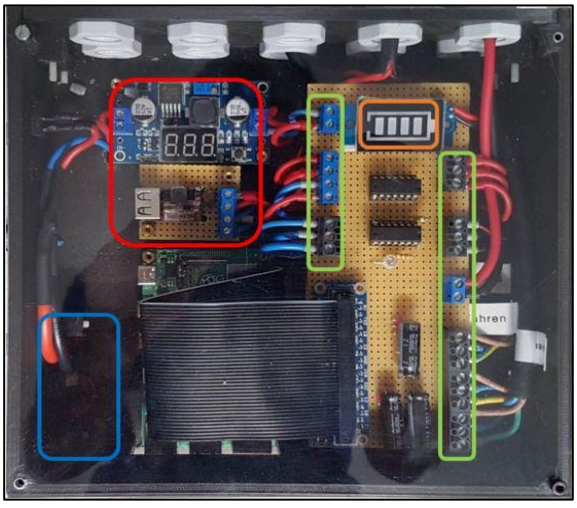


Figure 23: New circuit

Referring to figure 22 we can see that the main and control circuit are separated and connected with wires. Figure 23 shows the implementation upgrade. You can see that all electronic components are located on a single board, which is also connected to the brain of the system, Raspberry Pi using the ribbon cable (figure 24 c)).

6.1.2 Wiring Connection

Figure 24: Components used for connection.

Part of the consideration for the wire connection between the components is to have it to withstand the condition in the chamber. The chamber (figure 25) is set to simulate a high altitude setting which will have a higher temperature and pressure. This requirement leads to the decision to use a wire with a rating of ip67, which is waterproof. The connectors are also used to make the circuit easier to be troubleshoot and to be upgradeable for the next team.

Figure 25: Overview of the chamber

6.1.3 Power Supply

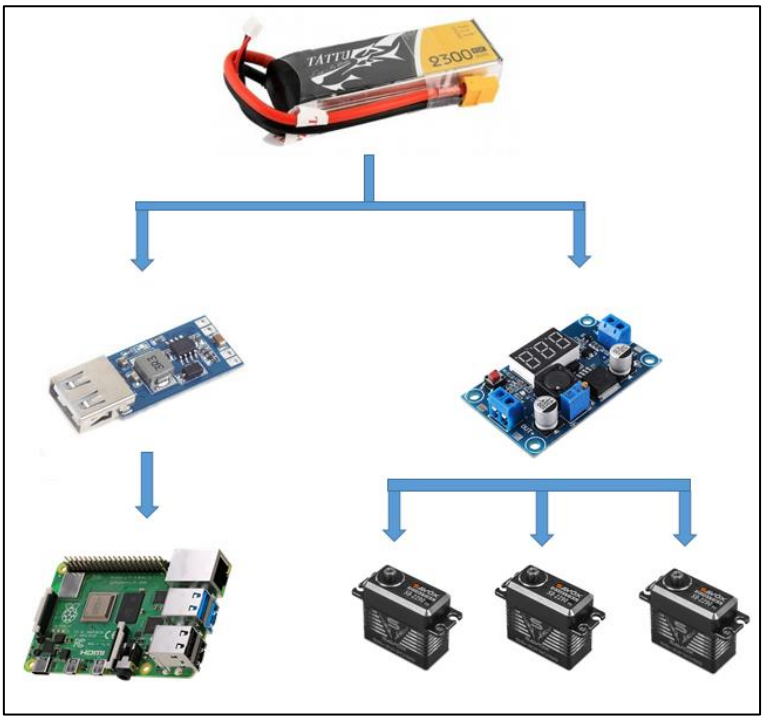


Figure 26: Distribution of power supply to two separate components

As the chainsaw will be isolated from any electrical socket during its test run in the chamber, it is important to create a system that is independent and can run on its own. An 11.1V LiPo has been selected to be used in our system in which the voltage is then regulated into two separate supplies. The first one is connected to the Raspberry Pi which will supply a constant 5V, 3A and the other one will also continuously supply the same voltage and current to the servo motors. The separation is done to ensure that there is no voltage drop throughout the system during its operation. This is important as the Raspberry Pi requires a sufficient amount of supply to run smoothly.

6.1.4 Circuit plan

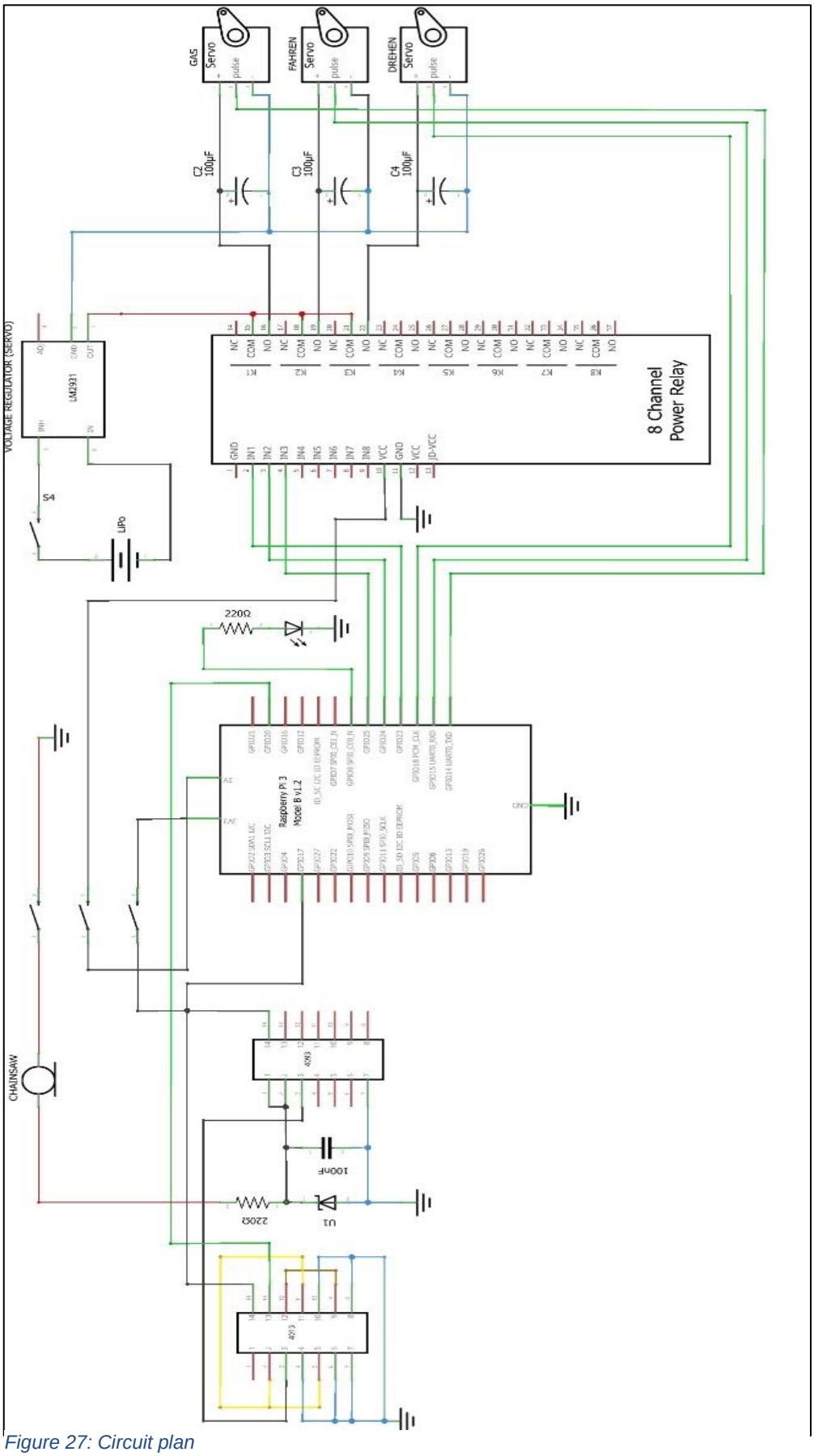


Figure 27: Circuit plan

6.2 Mechanical

From the previous MYiTOPS project, in terms of mechanical design, we noticed that there were a lot of improvements that can be done. Based on Table 5 these are the things that can be improved as well as the solution for it.

No	Things that can be improved	Solution
1	The platform has no handles to properly lift it.	Fabricate the handles and 3D-print an ergonomic handle for ease in carrying the platform.
2	The platform was made of wood and have a lot of unwanted holes which was not professionally looking.	Change the platform with an aluminium profile with T-slotted profiles for ease of assembling and disassembling the parts.
3	The electrical components were openly placed on the platform and messy wiring.	3D-print a proper electrical box to store all the electrical components and have a neat wiring routing.

Table 5: Table of things that can be improved

6.2.1 CAD design

Our mechanical team used the Creo Parametric Student Version as our CAD software. Regarding the design of the parts the following points were carefully taken into consideration:

- How to arrange the electrical parts (placement).
- How to mount the electrical parts on the Electrical Box.
- How to access the electrical parts easily when assembling and disassemble them.
- How many ports are needed to be in the box?
- How big will the electrical box be?

Figure 28 shows the full assembly drawing of the robot hand. The total dimensions are 800x600x269mm which fits perfectly in the chamber later on. From the isometric view of the robot hand, the parts are fastened onto the plate with M8 screws and T-nuts. Figures 29 and 30 are showing the drawing of the electrical box which contains all the electrical components as well as the 3D printed parts. The drawings of the 3D printed parts are shown in figure 30 to figure 35 (except figure 33 where a piece of acrylic was cut based on given dimensions).

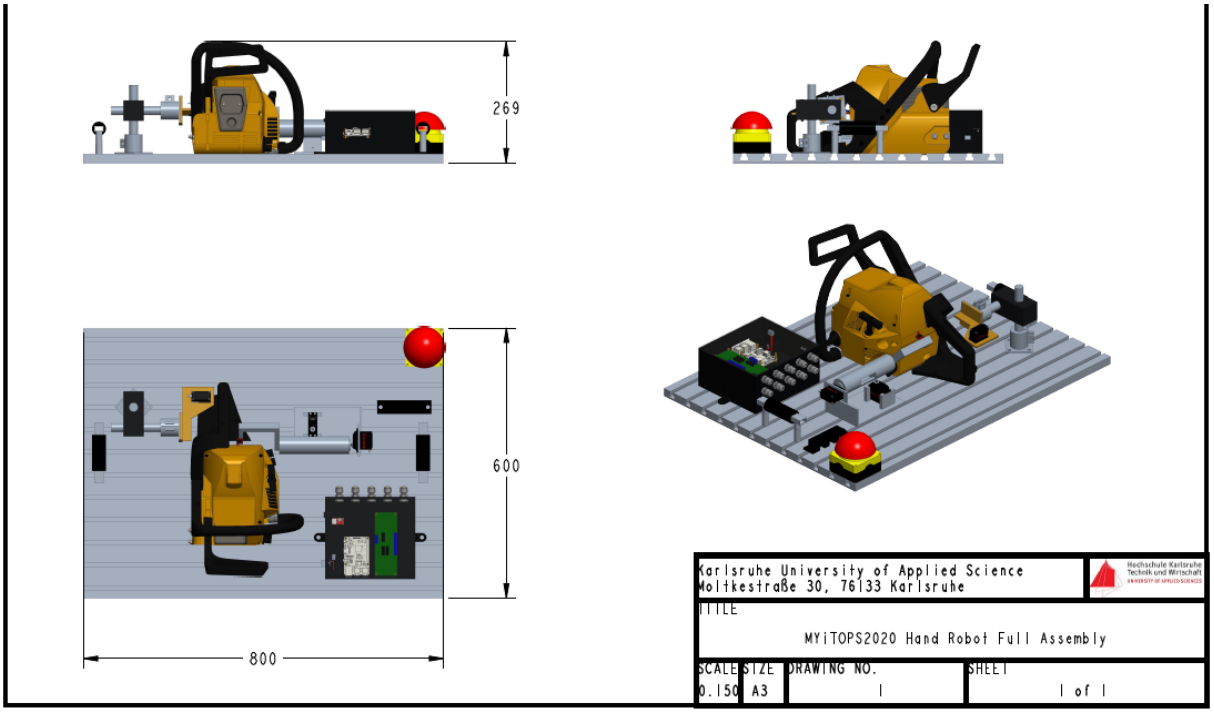


Figure 28: Full Assembly of the MYiTOPS2020 Robot Hand

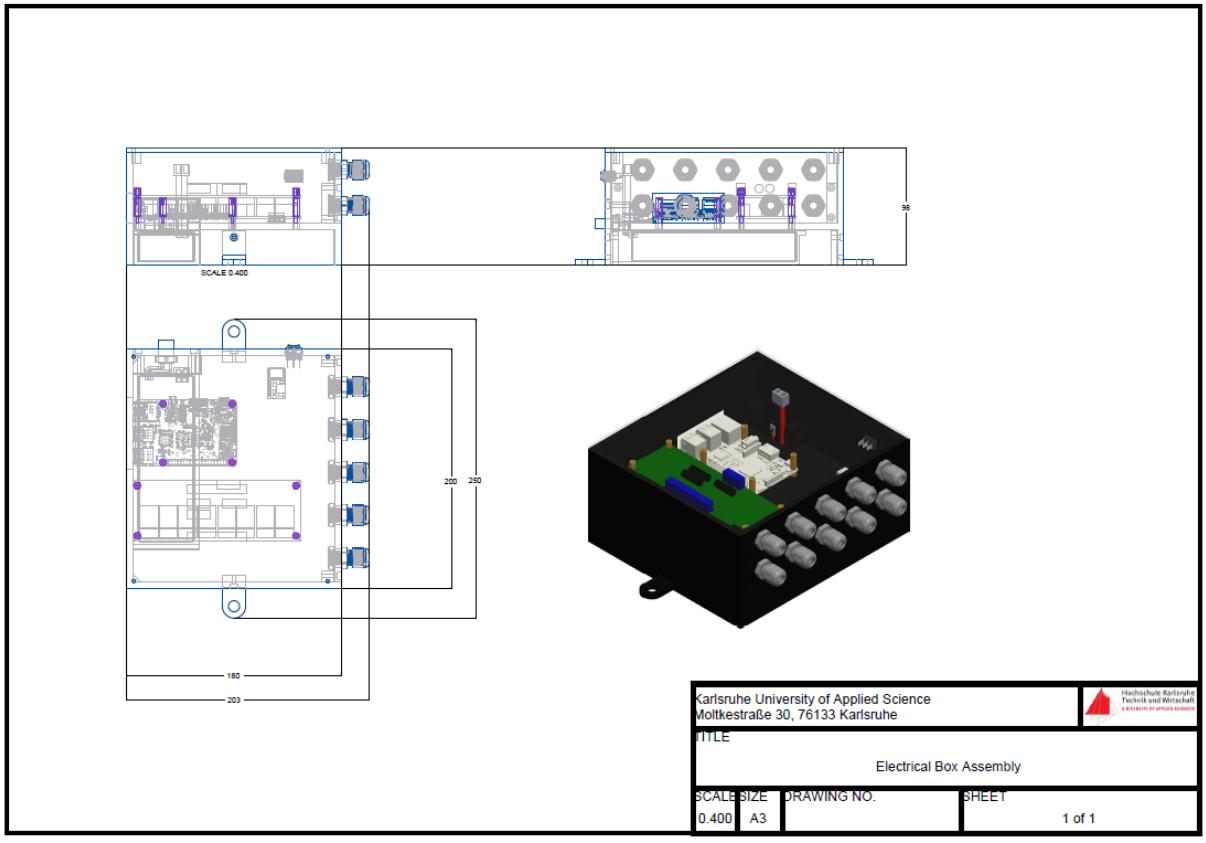


Figure 29: Electrical box assembly drawing

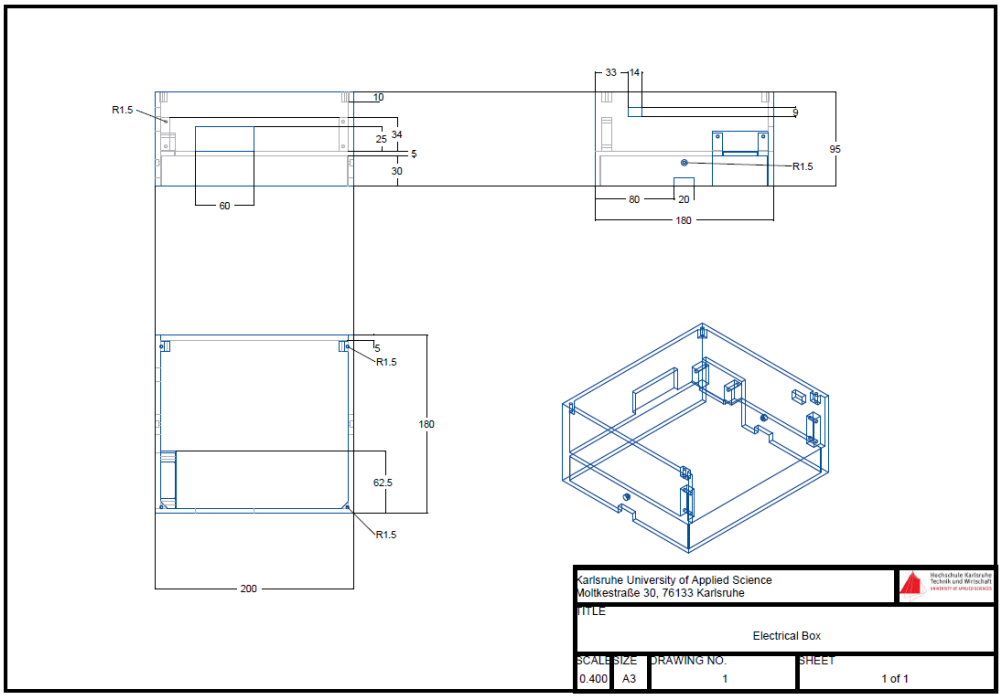


Figure 30: Electrical box drawing

Figure 29 shows the electrical box where the electrical components and 3D printed parts are mounted. Figure 30 shows the LiPo holder where LiPo battery is hold and later screwed under the electrical box.

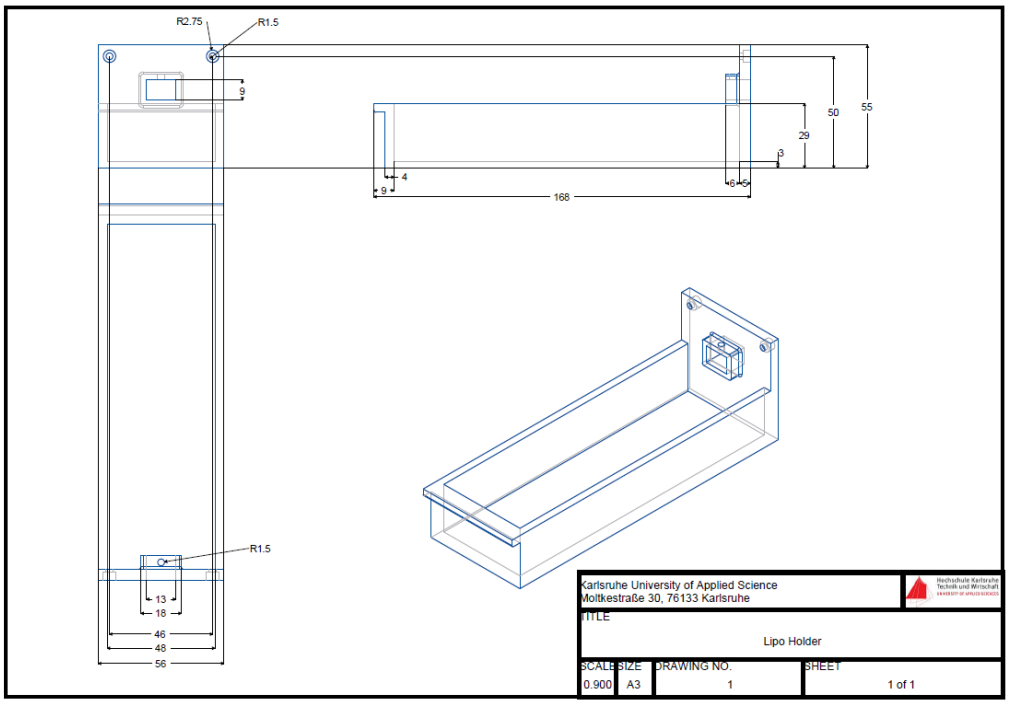


Figure 31: Lipo Holder

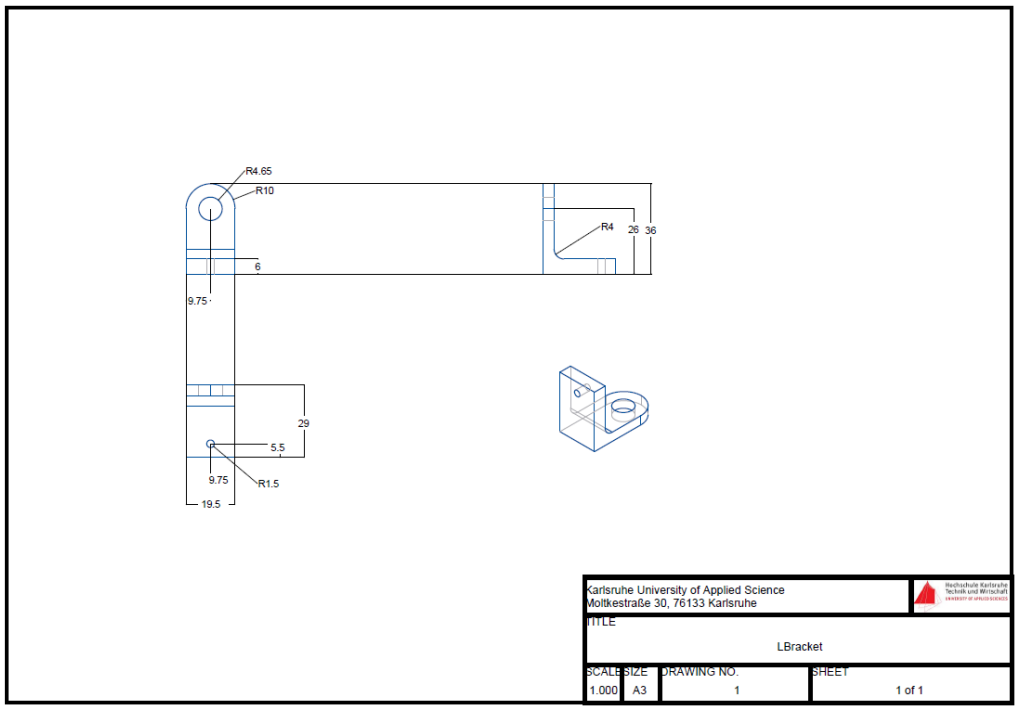


Figure 32: L-Bracket drawing

Figure 32 shows the L-Bracket where it holds the electrical box and later ground to the aluminium plate with M8 screws. Figure 33 is the electrical box cover which is made of acrylic so we can view the inside of the electrical components.

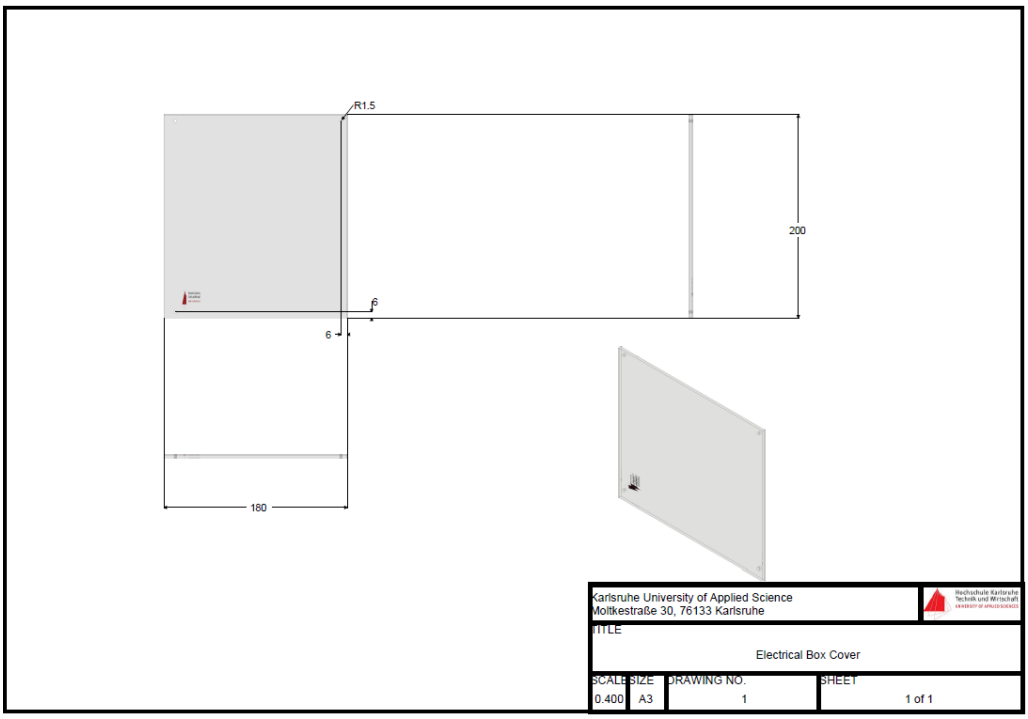


Figure 33: Electrical box cover drawing

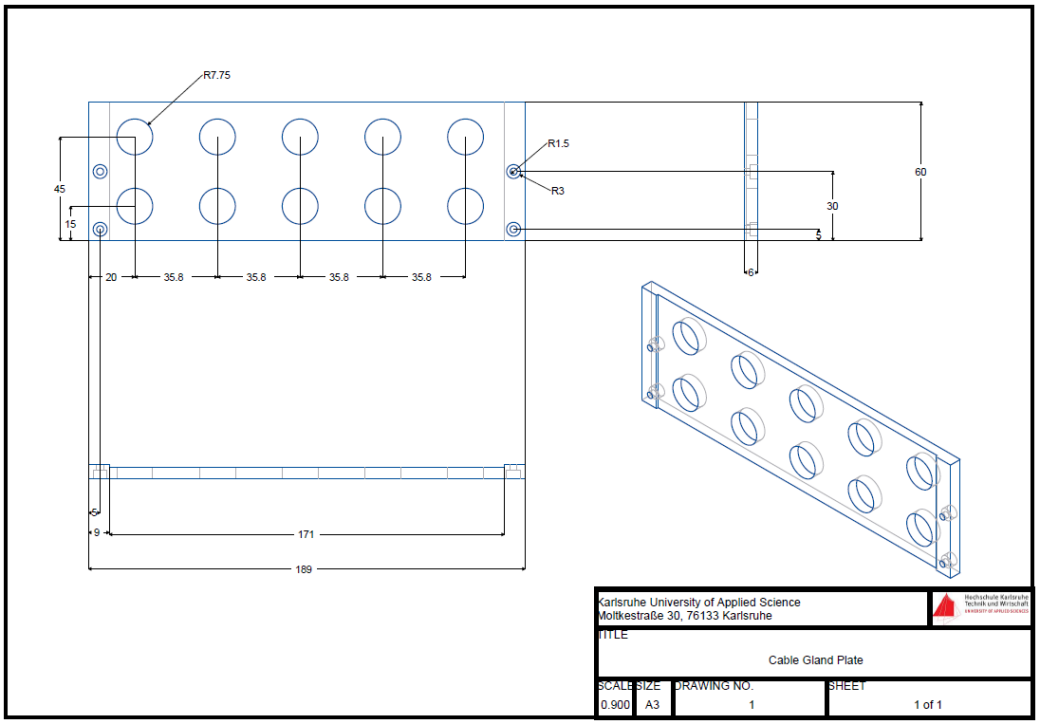


Figure 34: Cable gland plate drawing

In figure 34 is the cable gland plate where we screw the cable gland first and later screw the plate to the electrical box for ease in assembling. Figure 35 shows the cord holder where it holds the cords on to the aluminum plate, so it looks nice and tidy.

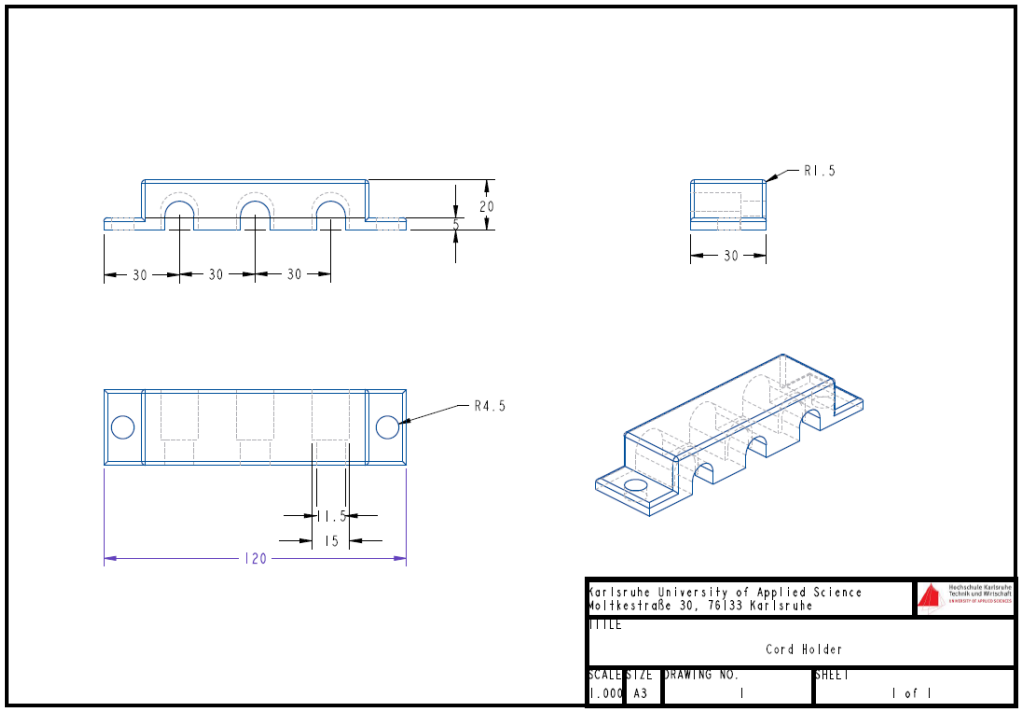


Figure 35: Cord Holder drawing

6.2.2 Fabrication

Once the design of necessary parts was finalized, we proceed to the fabrication process. We decided to use Fused Deposit Modelling (FDM) which is part of the material extrusion family in the additive manufacturing process. Thermoplastic polymers such as Acrylonitrile Butadiene Styrene (ABS) or Polylactic Acid (PLA) are used in FDM and it comes in a filament form[5]. There are numerous of justification why our mechanical team decided to choose this method:

- Due to the Coronavirus pandemic, most of the facilities were closed. Thus, buying a 3D printer was the best solution.
- Most of our designs are too complex to be fabricated. By 3D printing, we can resolve this issue.
- The parts that we want to fabricate must be lightweight and strong and at the same time cost effective. 3D printer can achieve this goal by using ABS or PLA material but in our case, we are using PLA as it is easier to print with this material and does not because warping effect compare to ABS. The infill pattern and the density of infill plays a main role in determining the strength of our parts.

6.2.2.1 Infill patterns

Infill patterns are a necessary part of printing a 3D object as they construct the internal structure of the object. There are many types of patterns and each one serves a different functionality on how the 3D object will be used. For our project we are using Grid patterns for all our parts. Figure 36 shows how Grid pattern looks like. Faster print speed can be achieved using this pattern as well providing medium strength to our parts[6]. For our requirement, medium strength is already enough to mount the electrical parts.

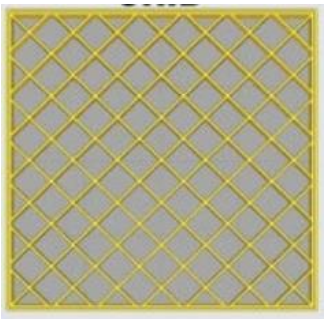


Figure 36: Grid Pattern

6.2.2.2 Infill density

Obviously, materials to print the parts cost money and deciding the proper infill density percentage is necessary. Furthermore, the higher the infill percentage, the heavier the parts. For our parts it has to be strong enough and lightweight, thus an infill of 20% density is already enough[6].

6.2.2.3 Materials

Since we are using Fused Deposit Modelling (FDM), only thermoplastic materials can be used, and the options were ABS and PLA. Table 3 shows the comparisons between PLA and ABS[7], [8].

Properties	PLA	ABS
Tensile Strength	Relatively similar tensile strength and both favorable for prototyping applications.	
Density	1.0 g/cm^3	1.3g/cm^3
Warping Effect	Less likely to happen due to its lower printing temperature	Most likely to have waring due to its high printing temperature needed thus require raft support to overcome this issue.
Surface Finishing	Semi-transparent thus producing a glossier surface finish.	Matte finish
Print Bed Temperature	60°C(optional)	80-110°C(mandatory)
Printing Temperature	180-230°C(*easier to print)	210-250°C
Sensitivity to Temperature Changes	Not sensitive at all. Does not require and enclosure nor a heating bed.	Can results to cracking and warping if sudden change of temperature drop happens. Heating bed and proper enclosure required.
Fumes	No to little fumes produced.	Intense and dangerous. Thus, proper ventilation/enclosure required.

Table 6: Comparison between PLA vs ABS

Based on the table above, all green highlighted texts are properties which are considered for the decision which materials suits project best – PLA.

7. PRODUCT DEVELOPMENT PHASE 4: ELABORATE

Due to the high complexity most of the elaboration is already shown in Chapter 5 and 6.
The task given to us had the requirements of a *product*. See requirement list on chapter 4.3:
The system will be operated by engineer and non-engineer operators, so it is necessary to consider the creation of a system which is stable, user-friendly and fast to install. The used parts are practically like industrial standards for a long lifetime and reliability.

As shown in the chapter 3, the decision on creating our system are referring to the Bruchsal environment chamber where the component chosen must be robust throughout the test run in the chamber.

8. THE IMPROVED SYSTEM

Figure 37: Properties of the improved system

Completed solution

While choosing the components, we pay attention to high quality, ease of use, security and kinship. In addition to our well-balanced hardware and software concept, a simple web control authorization was achieved that is controllable from all parts of the system where you have access to the internet. Instructions for use can be found in the PDF file. With the help of video tutorials, that we have prepared and enclosed, easy learning step by step is possible.

To ease the operation for the end user, the functions Autologin and Autorun is implemented, so that as the system turns on, the end user can directly control. This simplifies the start of the system and shortens user limits to access the program.

In order to be able to offer damage-proof test procedure at a low failure rate, the system has an emergency stop button and a timeout function. They ensure that the system is turned off after a pre-existing time when operator does not press a further button. This prevents the system and the device if the operator is no longer at the control unit and therefore the system is not monitored.

The prefabricated cabling and stable housing protect the system against damage caused by tension, pressure, bumps or vibrations. On one hand it is easier to transport, and on the other hand it can also be used in places that do not offer casual conditions like the environment chamber at Bruchsal.

We have expanded the usability of the system so that it can be used by different GUI devices (e.g. smartphone, tablet, PC) that can open a web browser. In this way, the user is more flexible in his work and in the choice of the location from which he would like to use the system.

With the help of the GIU interface, the user-friendliness has been significantly increased. Control elements can be used intuitively and can easily be individually adapted to the device to be tested. We were able to achieve that the effort to learn the system was noticeably reduced and it can be used more quickly by more than one person.

When revising the programming, it was important for us to identify as many sources of error as possible and to design the code in a way that they can be avoided or prevented. This enables a greater running stability and thus significantly increase the fault-free availability of the system.

With a view to further development of the system in the direction of versatile usability, we have created the prerequisites in programming so that very different devices can be tested with it in the future.

9. LIST OF DEVICES

	DEVICE	*FUNCTIONALITIY*
A	ACTUATORS	The actuators (servo motors) are used to adjust the choke and the gas of the chainsaw.
B	BATTERY CHARGER	Device from “Voltcraft” to re-use the Li-Po Battery.
	BOX	3D printed part to accommodate all possible electrical parts.
C	CHAINSAW	The device we like to control. The special task is that our project must be designed for different sizes of chainsaws without making big adjustments.
	CLAMPS	Mechanical, screwable parts for fixing the engine device at the top of the T-Nut plate.
	CABLE GLANTS	Inlets and outlets for the electrical box, PG9 size: Secures circuits from humidity, stress, increase overview.
	CORD HOLDER	3D printed part to fix the connector housings for the servos.
D	DC VOLTAGE REGULATOR	Supply from the Li-Po battery need to be drop down separately to the required voltage for Raspberry Pi and Relaymodule/Servo.
E	BATTERY INDICATOR	Display the current battery available. Important for safety issues.
D		
E	EMERGENCY STOP BUTTON	An emergency button that is intended to cut off all the voltage supplied to the machine and to stop the programming.
F	FREQUENCY TO BINARY CONVERTER CIRCUIT	The previous project developed a circuit, which can read out the frequency from the chainsaw’s ignition coil and translate it into an input signal that is readable by the Raspberry Pi.
	FILAMENT (BLACK)	Synthetic material for fused deposit modelling (FDM) 3D printing.
G		
H		
J		
K		
L	LI-PO BATTERY	Use to power up the Raspberry Pi and servomotor.
M	MAIN SWITCH	Switches power supply to the battery for ALL components. Attached at the side of the electrical box for easy handling.
N		
O		
P	PLUGS	3 –poled connector with round layout. Easy access to servos by screwable housings. Withstands humidity and stress.
R	RASPBERRY PI	A single board computer uses to communicate and control to other devices, such as the signal coming from the chainsaw is translated to RPM value. Input signal received from GUI is used to control the Chainsaw.
	RELAY MODULES	We use the control circuit from the Raspberry Pi at the Relay Modules to switch on higher currents, because the currents from Raspberry Pi’s GPIOs are not high enough to control the actuators.
S	SENSOR CLIPS	Pliers to grab the ignition signal from the engine to the converter circuit.

	SCREWS	Standardized Systems: M8 Screws and Threads for the T-Nut Plate. M3 Screws and Threads for the electrical box. M2,5 Screws and Threads for the electrical components (built-in).
T	T-NUT PLATE	Aluminium Plate 800x600x20 mm to fix the whole system.
	T-SLOT NUT	Special T-Nuts with M8 threads to improve flexibility.
U		
V		
W		
X		
Y		
Z		

Table 7: Device list

10. Instructions for use

For usage of the system, there is a User manual by Video enclosed.

11. CODE

The explanations of the functions that were written by team members from MYiTOPS2020 will be shown here:

1. Passing data from Cayenne to Raspberry Pi

```
def on_message(message):
    global OnOff_Flag
    global MotorSaegeButton_Flag
    global FreischneideButton_Flag
    global TrennschleiferButton_Flag
    global KaltstartButton_Flag
    global WarmstartButton_Flag
    global BetriebButton_Flag
    global StartStopSignalButton_Flag
    global TestProfileButton_Flag
    global ShutDown_Flag
    global Aus_Flag
    global Time_1
    global Time_2
    global Time_3
    global Throttle_1
    global Throttle_2
    global Throttle_3
    global Throttle
    global Connection_Timer
    global TestProfile

    Connection_Timer = time()

    if message.channel==1 :    #channel for on/off button
        if message.value=="1":
            OnOff_Flag = True
        elif message.value=="0":
            OnOff_Flag = False

    elif message.channel==2 :  #channel for MS
        if message.value=="1":
            MotorSaegeButton_Flag = True
        elif message.value=="0":
            MotorSaegeButton_Flag = False

    elif message.channel==3 :  #channel for FS
        if message.value=="1":
            FreischneideButton_Flag = True
        elif message.value=="0":
            FreischneideButton_Flag = False
```

```
    elif message.channel==31 :  #channel for throttle
        Throttle = float(message.value)

    elif message.channel==32 :  #channel for throttle 1 slider
        Throttle_1 = float(message.value)

    elif message.channel==33 :  #channel for throttle 2 slider
        Throttle_2 = float(message.value)

    elif message.channel==34 :  #channel for throttle 3 slider
        Throttle_3 = float(message.value)

    elif message.channel==35 :  #channel for time 1 slider
        Time_1 = float(message.value)

    elif message.channel==36 :  #channel for time 2 slider
        Time_2 = float(message.value)

    elif message.channel==37 :  #channel for time 3 slider
        Time_3 = float(message.value)
```

Figure 38: Function for passing data

The data can be passed from Cayenne to Raspberry Pi by allocating the channel number on each 'message.channel' as shown in figure 39. Flags are used to differentiate the states of the buttons in order to proceed to the next processes. Furthermore, the values can also be passed to the Raspberry Pi by creating objects for the values. This is important when the throttle and time values are used to run the test profile.

2. Test Profile function

```
572 def Test_Profile():
573
574     global Time_1
575     global Time_2
576     global Time_3
577     global Throttle_1
578     global Throttle_2
579     global Throttle_3
580     global Counter_1
581     global Counter_2
582     global Counter_3
583     global TestProfile
584
585     if (Counter_1<Time_1):
586         Gas_Servo.gas_prozent(Throttle_1)
587         client.virtualWrite(25, frequence_Reader.RPM, "analog_actuator", "null") # writing to RPM 1 cayenne
588         client.virtualWrite(40, frequence_Reader.RPM, "g", "rpm") #writing to the RPM test profile
589         client.virtualWrite(41, Throttle_1, "analog_sensor", "null") #writing to Throttle test profile
590         sleep(1)
591         Counter_1 += 1 # time increases until it reaches Counter_1
592
593     if (Counter_1==Time_1 and Counter_2<Time_2):
594         Gas_Servo.gas_prozent(Throttle_2)
595         client.virtualWrite(26, frequence_Reader.RPM, "analog_actuator", "null") # writing to RPM 2 cayenne
596         client.virtualWrite(40, frequence_Reader.RPM, "g", "rpm") #writing to the RPM test profile
597         client.virtualWrite(41, Throttle_2, "analog_sensor", "null") #writing to Throttle test profile
598         sleep(1)
599         Counter_2 += 1 # time increases until it reaches Counter_2
600
601     if (Counter_1==Time_1 and Counter_2==Time_2 and Counter_3<Time_3):
602         Gas_Servo.gas_prozent(Throttle_3)
603         client.virtualWrite(27, frequence_Reader.RPM, "analog_actuator", "null") # writing to RPM 3 cayenne
604         client.virtualWrite(40, frequence_Reader.RPM, "g", "rpm") #writing to the RPM test profile
605         client.virtualWrite(41, Throttle_3, "analog_sensor", "null") #writing to Throttle test profile
606         sleep(1)
607         Counter_3 += 1 # time increases until it reaches Counter_3
608
609     if (Counter_1==Time_1 and Counter_2==Time_2 and Counter_3==Time_3):
610         TestProfile = True #user has to repress test profile again to run the test test profile again
611         Gas_Servo.move(Winkel_Gas_min)
612         client.virtualWrite(20,1,"digital_sensor" , "d") # set the timout test profile to cayenne
613         Counter_1 = 0 # set all counters back to 0
614         Counter_2 = 0
615         Counter_3 = 0
```

Figure 39: Test Profile Process Function

Figure 39 shows the process of how the test profile is run after the user sets the values for the throttle and time sliders. Here there are three different types of counters that keep looping until they get the same value as the three different time values. For example, Counter_1 increases every time it loops until it has the same value as the Time_1 which is from the slider Time 1 on Cayenne. In the meantime, Throttle_1 value gets the value from Throttle 1 slider to control the gas level and the RPM value for Throttle 1 will be displayed on the Cayenne dashboard. It will go into the second 'if' function when the counter and time values are the same. When the process is finished, gas level goes back to minimum position and the counters will be reset back to 0.

3. Timeout function

```
617 def Time_out():
618     global Connection_Timer
619      # Timeout after 400 seconds
620     client.virtualWrite(21,1,"digital_sensor" , "d")
621     Connection_Timer = 0
622     print("Anlage aus")
623     Gas_Servo.ausschalten()
624     Chokehebel_fahren_Servo.ausschalten()
625     Chokehebel_drehen_Servo.ausschalten()
626     pi.write(Gas_Relais_GPIO, 0)
627     pi.write(Chokehebel_fahren_Relais_GPIO, 0)
628     pi.write(Chokehebel_drehen_Relais_GPIO, 0)
629     Relais_Setup()
630     Grundstellung()
631     sleep(2)
632     client.virtualWrite(21,0,"digital_sensor" , "d")
```

```
803             # Program restarts after timeout for 400 seconds
804             if (Connection_Timer > 0) and (Connection_Timer + 400 < time()):
805                 Time_out()
```

Figure 40: Time out function

Figure 40 shows the timeout function. It is activated when the user does not click anything on the widgets on Cayenne dashboard for 400 seconds. Servos will go back to their original positions. This is important because there are users who do not control the chainsaw on the spot, the relays and servos will be restarted in case the users lose the accessibility of controlling the chainsaw suddenly.

4. Internet connection

```
634 def connect(host='http://google.com'):
635     try:
636         urllib.request.urlopen(host) #open the google if there is internet connection
637         return True
638     except:
639         #if no internet it does this
640         Gas_Servo.ausschalten()
641         Chokehebel_fahren_Servo.ausschalten()
642         Chokehebel_drehen_Servo.ausschalten()
643         pi.write(Gas_Relais_GPIO, 0)
644         pi.write(Chokehebel_fahren_Relais_GPIO, 0)
645         pi.write(Chokehebel_drehen_Relais_GPIO, 0)
646         return False
647     print( "connected" if connect() else "no internet!" )
```

Figure 41: Internet connection function

The function shown in figure 41 tries to open Google when there is internet. When the internet connection is lost, the servos and relays will be restarted.

5. Shut down button

```
800             if ShutDown_Flag:
801                 os.system('sudo shutdown -h now')
```

Figure 42: Shut down function

The function associates with the shutdown button on Cayenne dashboard. When the button is pressed, the command ‘sudo shutdown -h now’ is called and the Raspberry Pi will be turned off. This can be seen in figure 42.

HOCHSCHULE KARLSRUHE
TECHNIK UND WIRTSCHAFT

Fakultät Maschinenbau Mechatronik MMT

Type of session / Protocol type	**Development project MYiTOP5 team meeting**			
Date of the session	25.03.2020			
Start/end	10:00-12:00			
Type of communication	Skype			
Record keeping	Jai			
Attendees	Daria Masny-Kulak Johannes Keßler Jin Yun Ng Alyxie Anthony Jannick Ungerer	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒ ☐ ☐ ☐
Guests	Danial Haris Bin Limi Hawari			

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S

DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin Jai	Jannick Alyxie	Hussein Johannes
➪ Programming ➪ Raspberri Pi connection ➪ Documentation	➪ Mechanical- and Electrical Components	➪ Data Server ➪ Budget Plan ➪ GUI (Interface)

Nr. 1: Goal setting

- ➪ Run the Chainsaw using the previous Script
- ➪ Learn about the MQTT protocol
- ➪ Read Danial thesis
- ➪ Install python and Mosquito MQTT
- ➪ Change from old communication system to new

HOCHSCHULE KARLSRUHE
TECHNIK UND WIRTSCHAFT

Fakultät Maschinenbau Mechatronik MMT

Nr. 2: Collection of ideas

- ➪ MQTT protocol to exchange from M2M. Setup a broker and subscriber.
- ➪ Make a cloud broker, to allow international data exchange
- ➪ Use MQTT public broker (Mosquitto testing broker, Mosca broker, etc.)
- ➪ MQTT Dashboard software (download the app)
- ➪ Servo motor to control the throttle actuator (mechanical design)
- ➪ Add new sensor (LAMDA, Exhaust)

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Install Mosquito MQTT	everybody	30.03.2020	done
Learn about the MQTT protokol	everybody	30.03.2020	done
Add new parts for the Order List	everybody	30.03.2020	done

Type of session / Protocol type	**Development project MYTOPS team meeting**			
Date of the session	23.03.20			
Start/end	10:00-13:00			
Type of communication	Skype			
Record keeping	Johannes Keßler			
Attendees	Daria Masny-Kulak Johannes Keßler Jin Yun Ng Alyxie Anthony Jannick Ungerer	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒
Guests	Supervisor Dipl.-Phys. Ferhat Aslan			

Nr.	Topic:	Who	Description
1	Division into sub-groups	all	DE
2	Goal setting	all	D
3	Collection of ideas	all	DE
4	Planning for the next meeting	all	S

DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin Jai	Jannick Alyxie	Hussein Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 2: Goal setting

- ⇨ System should be useable for „normal" guy
- ⇨ Easy to understand with user manual
- ⇨ Graphical user Interface is important -> Input-options like phone/tablet with Blink or LabView via touchscreen maybe
- ⇨ New cloud connection -> Danials Work
- ⇨ Using different equipment / chainsaw sizes in Bruchsal (Simulation room)

HOCHSCHULE KARLSRUHE
TECHNIK UND WIRTSCHAFT

Fakultät
Maschinenbau
Mechatronik
MMT

Nr. 3: Collection of ideas

- ⇨ Using Python 3 for coding
- ⇨ Asking Danial to connect to cloud

Nr. 4: Planning for the next meeting

Task	Who?	Until when?	Done?
View the data on Dropbox, think about new parts for the Order List	everybody	30.03.2020	done
Understand the Python code	Group 1	30.03.2020	done
Read and understand Danials work	Group 2	25.03.2020	done
Get Chainsaw and test	Group 3	30.03.2020	done
Invite Daniel to the conference	Lujaini	25.03.2020	done

Type of session / Protocol type	**Development project MYiTOPS team meeting**		
Date of the session	30.03.2020		
Start/end	10:00-12:00		
Type of communication	Skype		
Record keeping	Daria		
Attendees	Daria Masny-Kulak ☒ Johannes Keßler ☒ Jin Yun Ng ☒ Alyxie Anthony ☒ Jannick Ungerer ☒	Hussein AL-Faiz ☒ Lujaini ☒	
Guests	Supervisors: Dipl.-Phys. Ferhat Aslan and Prof. Dr. Maurice Kettner		

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S

DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin Jai	Jannick Alyxie	Hussein Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

- ⇨ Learn about the MQTT protocol
- ⇨ Install Anaconda for Python 3
- ⇨ Do small code corrections
- ⇨ Install MQTT protocol to exchange from M2M. Setup a broker and subscriber.
- ⇨ Connect and subscribe to the broker ,use MQTT public broker (Mosquitto testing broker, Mosca broker, etc.)
- ⇨ Data exchange with at least 2 clients (CODE +MQTT)
- ⇨ Make a cloud broker, to allow international data exchange

Nr. 2: Collection of ideas

- ⇨ MQTT Dashboard software (download the app)
- ⇨ Servo motor to control the throttle actuator (mechanical design)
- ⇨ Add new sensor (LAMDA, Exhaust)
- ⇨ Screen and Raspberry should be separate

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Add new parts for the Order List	Group 3	now	done
Select a person who will go to Bruchsal with Ferhat Aslan	Group 2	5.04.2020	canceled
Group registration for project participation at HsKa	Daria	now	done
Data exchange with at least 2 clients (CODE +MQTT)	Group 1	06.04.2020	done
Trip to the Bauhaus	Group 2	-	canceled

Type of session / Protocol type	**Development project MYiTOPS team meeting**			
Date of the session	07.04.2020			
Start/end	14:00-16:30			
Type of communication	Skype			
Record keeping	Daria			
Attendees	Daria Masny-Kulak Johannes Keßler Jin Yun Ng Alyxie Anthony Jannick Ungerer	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒ ☐ ☐ ☐
Guests	Supervisors: Dipl.-Phys. Ferhat Aslan, Danial Haris Bin Limi Hawari			

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S

DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin Jai	Jannick Alyxie	Hussein Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

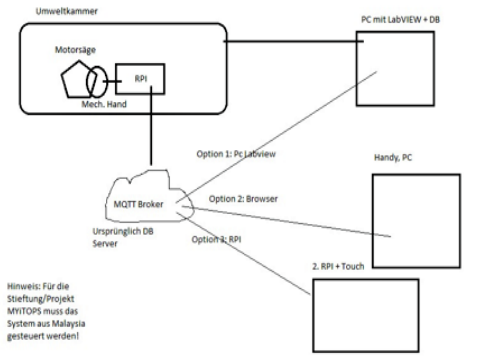
HOCHSCHULE KARLSRUHE
TECHNIK UND WIRTSCHAFT

Fakultät Maschinenbau Mechatronik
MMT

Nr. 1: Goal setting

- ⇨ Change the previous communication protocol according to the latest industrial standard
- ⇨ Save all information regarding the state or the status of the chainsaw engine into an Excel file (or in any other file)
- ⇨ Save all information regarding the state or the status of the chainsaw engine into an Excel file (or in any other file)
- ⇨ Automatically run the test bench by loading an Excel file into the script.
  E.g. Pull 10% of gas throttle for 10s, pull 50% for 60s, 100s for 10s, 80% for 30, 40s for 20, and release the throttle after 20s.
- ⇨ Create a communication diagram, what message, what topic you want to use between customers.
- ⇨ We no longer need to use the database method. The new IoT communication protocol is built into the script.
- ⇨ The primary purpose of JSON files is to exchange data between different programs or server client systems.

Nr. 2: Collection of ideas



HOCHSCHULE KARLSRUHE
TECHNIK UND WIRTSCHAFT

Fakultät Maschinenbau Mechatronik
MMT

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Make a cloud broker, to allow international data exchange	Group 1	Next meeting	Done
Create a communication diagram, what message, what topic you want to use between customers.	Group 1		Not done yet in terms of subscriber
o Technical data of the mounting plate o Plant in operation (video) o Organize thesis for us	Ferhat Aslan	Next meeting	Previous thesis had already been shared in the dropbox.
Build the new IoT communication protocol into the script.	Group 1		Not Done
requirements list / black box	Group 1,2,3	Until Deadline	Not Done
Gantt chart	Alyxie	Until Deadline	Not Done

Type of session / Protocol type	**Development project MYiTOPS team meeting**		
Date of the session	14.04.20		
Start/end	14:00-15:00		
Type of communication	Skype		
Record keeping	Daria		
Attendees	Daria Masny-Kulak ☒ Johannes Keßler ☒ Jin Yun Ng ☒ Alyxie Anthony ☒ Jannick Ungerer ☒	Hussein AL-Faiz ☒ Lujaini ☒	
Guests	Supervisor: Dipl.-Phys. Ferhat Aslan		

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
4			
5			
6			
7			
8			
9			
10			

DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin Jai	Jannick Alyxie	Hussein Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

⇨ Use Cayenne-MQTT-Python to create the Gui and write instructions for the user
⇨ add a photo of the entire system in the web browser (at the end of project)

Nr. 2: Collection of ideas

⇨ optional a Raspberry camera for the visualization of the system at a distance (webcam)

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
create a list of functionalities for the different devices (depending on the type of device)	Group 2	Next meeting	done
try to connect Gui and Raspberry via „Cayenne"	Group 3	Next meeting	done
inform the other group abroad about the procedure (Cayenne)	Hussein AL-Faiz Lujaini	now	done
inform the other group in Germany about the procedure and order two raspberries for this group	Johannes Keßler	now	done
Definition of Topics for data exchange via MQTT. First implementation of clients and server.	Group 1	Next meeting	done

Type of session / Protocol type	**Development project MYiTOPS team meeting**		
Date of the session	18.04.2020		
Start/end	17:00 – 19:30		
Type of communication	Skype		
Record keeping	Johannes Keßler		
Attendees	Daria Masny-Kulak ☒ Johannes Keßler ☒ Jin Yun Ng ☒ Alyxie Anthony ☒ Jannick Ungerer ☒	Hussein AL-Faiz ☒ Lujaini ☒	
Guests	Jannik Lassen, Johannes Neckel		

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
4			
5			
6			
7			
8			
9			
10			

DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin Jai	Jannick Alyxie	Hussein Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

- Interchange ideas with the MYiTops Malaysia group
- Discuss the ability of Cayenne
- Compare the position and experience between the groups

Nr. 2: Collection of ideas

- Dashboard options:
  - Labview will be more professionel
  - Web browser will be more flexible
- Security of information and protocol
- Kind of protocol and requirements

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Question to Ferhat: What about the security of the dashboard in Cayenne	everyone	Monday, 20.04.2020	Done
Question to Ferhat: Better being flexible than being secured -> industrial standard?	everyone	Monday, 20.04.2020	Done
Exchange informations • Car protocol 2019 • Danials videos	Johannes Keßler	immediately	Done
bring GUI data in phythonscript first idees and reflectations	Group 1 and 3	Over the next week	Done

Type of session / Protocol type	**Development project MYiTOPS team meeting**
Date of the session	20.04.2020
Start/end	18:00-20:00
Type of communication	Skype
Record keeping	Daria, Johannes
Attendees	Daria Masny-Kulak ☒ Johannes Keßler ☒ Jin Yun Ng ☒ Alyxie Anthony ☒ Jannick Ungerer ☒ Hussein AL-Faiz ☒ Lujaini ☒
Guests	Supervisors: Dipl.-Phys. Ferhat Aslan, Danial Haris Bin Limi Hawari

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
4			
5			
6			
7			
8			
9			
10			

DE = decision, D = discussion, I = information, S = standard TOP

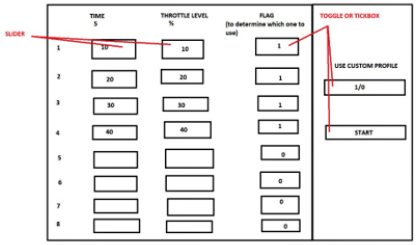
Group 1	Group 2	Group 3
Daria Edwin Jai	Jannick Alyxie	Hussein Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

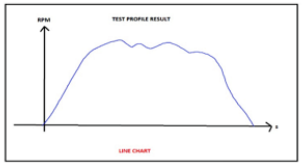
- GUI link is an open link
- HsKa edits the order list. Duration about 2 weeks
- Forward the future order lists to Mr. Bernhard Beck:
  Email: bernhard.beck@hs-karlsruhe.de
  Tel. (0721) 925-1692
  Fax (0721) 925-1707

Nr. 2: Collection of ideas

- Idea for the test profile for using Cayenne



- Example for how to display the result in the Cayenne



Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Migration of the database connection of the Raspberry Pi to data exchange using the mqtt protocol.	Group 1	Next meeting	Done
Make a list of features for these two devices: • Stihl chainsaw • Stihl brush cutter Think how you can extend the system and code.	Group 1, 2, 3		Done
Find a solution to the following problems (Cayenne): • Multiple Gui users at the same time • Passing a string as a message parameter • put Danials idee into effect	Group 3	Next meeting	Done
Plan in a structured way how to bring the mechanical part and code part together.	Group 1, 2		Done
check this out: https://cedalo.com/ Cedalo streamsheet Gui from Danials thesis, different possibility	Group 3		Done
Manage to run chainsaw using MQTT Cayenne GUI	Group 1	Next meeting	Done

Type of session / Protocol type	**Development project MYiTOPS team meeting**			
Date of the session	27.04.2020			
Start/end	10:00-12:00			
Type of communication	Skype			
Record keeping	Johannes Kessler			
Attendees	Daria Masny-Kulak Johannes Keßler Jin Yun Ng Alyxie Anthony Jannick Ungerer	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒
Guests	Supervisor Ferhat Alsan and Danial Harris			

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin Jai	Jannick Alyxie	Hussein Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

- GUI design and functions
- Working on GUI implementation
- Electronics and layout of the circuit
- standardisation of documentation

Nr. 2: Collection of ideas

- Orderlist is in secretary of HsKa and will be buyed the next days
- 3D printer is privided by HsKa
- Design of the printed parts determinated in Black&Orange
- Electrical layout and circuits need a comprehensible documentation
- GUI group will manage the motorprocess functions in pythonscript

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Orderlist Bezeichnung_Anzahl_Preis_Link In Email to Ferhat	Johannes	today	Done after meeting
Overview and further designs of documentation	Daria	Next meeting	Done
Further implementations of GUI in pythonscript	Group 1 (except Daria) & Group 3	Next meeting	Done
Begin documentation of the Raspberry GPIOs and the electric wiring	Group 2	Next meeting	Carried to next protocoll
Discuss electric construction with industrial layout (no jumperwires, welding)	Group 2	Next meeting	Carried to next protocoll

Type of session / Protocol type	**Development project MYiTOPS team meeting**		
Date of the session	04.05.2020		
Start/end	10:00 – 12:00		
Type of communication	Skype		
Record keeping	Johannes Keßler		
Attendees	Daria Masny-Kulak ☒ Johannes Keßler ☒ Jin Yun Ng ☒ Alyxie Anthony ☒ Jannick Ungerer ☒	Hussein AL-Faiz ☒ Lujaini ☒	
Guests	Supervisor Ferhat Aslan, Danial Harris		

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin Jai	Jannick Alyxie	Hussein Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

Questions to Ferhat

Discuss the actual process

Nr. 2: Collection of ideas

Camera for the environment chamber
- Water- and Dustproof
- maybe Rasberrycamera
- Starting with camera from Ferhat

Timeout and Error handling

Switching of whole t-nut-plate in bruchsal

Backup of code in Github

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Looking for T-Nut-Plate design	Group 2	order arrives	Done
CAD Casedesign	Group 2	deadline	Carried to next protocoll
Documentation of the Raspberry GPIOs and the electric wiring for	Jai	Next Meeting	Done
Discuss electric construction with industrial layout (no jumperwires, soldering)	Group 2	deadline	Done
troubleshooting and timeout functions	Group 1,3	Next meeting	Carried to next protocoll
Implement test profile function in pythoncode	Group 1,3	18.05.20	Carried to next protocoll
Begin of camera implementation	Daria	deadline	Done

Type of session / Protocol type	**Development project MYiTOPS team meeting**		
Date of the session	11.05.2020		
Start/end	10:00-12:00		
Type of communication	Skype		
Record keeping	Johannes Keßler, Daria Masny		
Attendees	Daria Masny-Kulak ☒ Johannes Keßler ☒ Jin Yun Ng ☒ Alyxie Anthony ☒ Jannick Ungerer ☒	Hussein AL-Faiz ☒ Lujaini ☒	
Guests	Supervisor Ferhat Aslan, Danial Harris		

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin Jai	Jannick Alyxie	Hussein Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

HOCHSCHULE KARLSRUHE
TECHNIK UND WIRTSCHAFT

Fakultät
Maschinenbau
Mechatronik
MMT

Nr. 1: Goal setting

- Refreshement of current informations

Nr. 2: Collection of ideas

- Temperatur of environment chamber –30° Celsius up to +40°Celsius
- Socket and Plug for wiring
- Configuration with industry-standardization cable
  - Every electric connection with stress relief via turn in or link in contacts
- Raspberry Pi, Condensatorplatine in Case

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Look for Plugs and Sockets	Jannick Ungerer	friday 15.05.2020	Done
Systems resists mechanical influence	Group 2	deadline	

Type of session / Protocol type	**Development project MYiTOPS team meeting**			
Date of the session	15.05.2020			
Start/end	9:00 – 12:00			
Type of communication	Skype			
Record keeping	Johannes Keßler			
Attendees	Daria Masny-Kulak Johannes Keßler Jin Yun Ng Alyxie Anthony Jannick Ungerer	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒
Guests	-			

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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Group 1	Group 2	Group 3
Daria Edwin	Jannick Alyxie Hussein	Jai Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

- Discussion about the Emergency Button
- Camera
- Handling of new parts
- SIM card module

Nr. 2: Collection of ideas

Emergency button

- Hardware shutdown by emergency button
- Software changes Flags and wait for restart
- User get informed by GUI led

SIM card module

- HsKA can't allow portextentions -> no streaming
- Streaming via private Network -> Malaysia can control without firewall
- Handy Hotspot isn't possible as result of changing IP Adress

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
CAD Casedesign	Hussein	3D printer arrives	
Buy plugs and sockets for servo and emergency button connection	Jannick	Next Meetting	Done
Change electric construction with industrial layout (no jumperwires, soldering)	Jannick Alexie	Workshopday at Johannes	26. Mai. 2020
Change mechanic construction by using T-Nut-Plate	Jannick Alexie	Workshopday at Johannes	26. Mai. 2020
troubleshooting and emergency functions	Group 1,3	Next meeting	Done
Try to test profile function in pythoncode	Group 1,3	Next meeting	Carried to next protocoll
Network solution with HsKA Firewall and SIMcard	Everyone	Next meeting with Ferhat	Done

Type of session / Protocol type	**Development project MYiTOPS team meeting**		
Date of the session	18.05.2020		
Start/end	10:00 – 12:00		
Type of communication	Skype		
Record keeping	Johannes Keßler		
Attendees	Daria Masny-Kulak ☒ Johannes Keßler ☒ Jin Yun Ng ☒ Alyxie Anthony ☒ Jannick Ungerer ☒	Hussein AL-Faiz ☒ Lujaini ☒	
Guests	Supervisor Ferhat Aslan, Danial Harris		

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin Jai	Jannick Alyxie	Hussein Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

HOCHSCHULE KARLSRUHE
TECHNIK UND WIRTSCHAFT

Fakultät
Maschinenbau
Mechatronik
MMT

Nr. 1: Goal setting

- Demand list
- Firewall and Network settings HsKA

Nr. 2: Collection of ideas

- Product layout is biggest goal -> new actors/ sensors only if time is left
- Using wireless SIM network hotspot -> getting device like this https://www.amazon.de/ZTE-MF91D-MiFi-Mobile-Hotspot/dp/B00CRCCQM4?tag=testbericht_c-21&ascsubtag=8441290870389478 40
- Being focused on the goal to produce a good product. NO prototype.
  - Easy to use and stable system is the most important thing

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Looking for SIM Module and TelephoneCard	Daria	Next Metting	Done
Try to test profile function in pythoncode	Group 1,3	Workshopday at Johannes	26. Mai. 2020
CAD Casedesign	Hussein	3D printer arrives	Done
Change electric construction with industrial layout (no jumperwires, soldering)	Jannick Alexie	Workshopday at Johannes	26. Mai. 2020
Change mechanic construction by using T-Nut-Plate	Jannick Alexie	Workshopday at Johannes	26. Mai. 2020

Type of session / Protocol type	**Development project MYiTOPS team meeting**
Date of the session	25.5.20
Start/end	10:00 – 11:00
Type of communication	Skype
Record keeping	Johannes Keßler
Attendees	Daria Masny-Kulak ☒, Johannes Keßler ☒, Jin Yun Ng ☒, Alyxie Anthony ☒, Jannick Ungerer ☒, Hussein AL-Faiz Lujaini ☒
Guests	Supervisor Ferhat Aslan, Danial Harris

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin	Jannick Alyxie Hussein	Jai Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

- Discuss about "key ready" and draw up user manual
- Registration Data of Cayenne and RPi – IKKU Lab?
- Improve the Housing Box

Nr. 2: Collection of ideas

- Working with Plug&Socket for each servomotor at the Housing or Servos
- Autostart of Python scrypt -> only one button to boot up whole system
- SIM Card 1GB
- SIM Module for Raspberry with extern antenna, no hotspot

To example:
https://www.amazon.de/ARCELI-Kleinster-Breakout-Modul-Quad-Band-SIM-Kartensteckplatz/dp/B07RHLP45T/ref=asc_df_B07RHLP45T/?tag=googshopde-21&linkCode=df0&hvadid=407389247407&hvpos=&hvnetw=g&hvrand=7496450433366996436&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9041843&hvtargid=pla-804631671314&psc=1&th=1&psc=1&tag=&ref=&adgrpid=88734954362&hvpone=&hvptwo=&hvadid=407389247407&hvpos=&hvnetw=g&hvrand=7496450433366996436&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9041843&hvtargid=pla-804631671314

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Try to test profile function in pythoncode	Group 1,3	Workshopday at Johannes	Carried to the Next Protocoll
Change electric construction with industrial layout (no jumperwires, soldering)	Jannick Alexie	Workshopday at Johannes	Done
Change mechanic construction by using T-Nut-Plate	Jannick Alexie	Workshopday at Johannes	Done
CAD Improvement	Hussein	3D printer arrives	Done
Cayenne Background	Johannes	Next meeting	Done
Autostart Python Script	Daria, Jai	Next meeting	
Sim Module and questions of registration to ferhat	Daria	Next meeting	Done

Type of session / Protocol type	**Development project MYiTOPS team meeting**			
Date of the session	preparation			
Start/end	10:00 -			
Type of communication	Skype			
Record keeping				
Attendees	Daria Masny-Kulak Johannes Keßler Jin Yun Ng Alyxie Anthony Jannick Ungerer	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒
Guests	Supervisor Ferhat Aslan, Danial Harris			

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin	Jannick Alyxie Hussein	Jai Johannes
➪ Programming ➪ Raspberri Pi connection ➪ Documentation	➪ Mechanical- and Electrical Components	➪ Data Server ➪ Budget Plan ➪ GUI (Interface)

Nr. 1: Goal setting

- New order list
- Registration issue for Cayenne, Rpi, Vodafone

Nr. 2: Collection of ideas

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Try to test profile function in pythoncode	Group 1,3	open	
Contract for Vodafone Prepaid Card			

Type of session / Protocol type	**Development project MYiTOPS team meeting**			
Date of the session	3.06.2020			
Start/end	10:00-11:15			
Type of communication	Skype			
Record keeping	Daria			
Attendees	Daria Masny-Kulak Johannes Keßler Jin Yun Ng Alyxie Anthony Jannick Ungerer	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒
Guests	Supervisor Ferhat Aslan, Danial Harris			

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin	Jannick Alyxie Hussein	Jai Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

Collect bills, sort them and hand them all in together

Nr. 2: Collection of ideas

planning a real meeting for 8.06.2020 at 5:00 p.m.

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Let the saw run after the modification	Edwin	Next meeting	Done
automatic login / program autorun	Daria	Next meeting	Still in progress
Questions after grading the documentation	everyone	Next Meeting	Done
continue the documentation	everyone	now	Still in progress
see if cayenne can be expanded with a graphic (possibly buy a full version)	Johannes	Next meeting	Still in progress
read about poster	Daria	Next meeting	Done

Type of session / Protocol type	**Development project MYiTOPS team meeting**			
Date of the session	8.6.2020			
Start/end	17:00 – 22:00			
Type of communication	Meeting in Edwin Lab			
Record keeping	Johannes Keßler			
Attendees	Daria Masny-Kulak Johannes Keßler Jin Yun Ng Alyxie Anthony Jannick Ungerer	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒
Guests	-			

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin	Jannick Alyxie Hussein	Jai Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

- Eating good pizza
- Collection of open tasks
- distribution of tasks
- Mutual informing

Nr. 2: Collection of ideas

- Timeslots of close days and weeks to the tasks
- whos suits the best for the task
- preparation of incoming orders
- autorun first testings

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
automatic login / program autorun	Daria	Next meeting	Done
Continue general documentation	Daria	Next meeting	Changed to different layout
Graphics for cayenne	Johannes	Next meeting	Not Requiret
Finish Requirement List	Johannes	Next meeting	Done
Try to run GPRS module	Johannes	Next meeting	Still in Progress
Fix Parts & boards in printed Box	Hussein	Parts of order arrives	Still in Progress
Design cable-cover (3D printed)	Hussein	Next Meeting	Done
Continue GANTT-chart	Alexei	Next Meeting	Still in Progress
Adjust Actors, change Nutensteine, Cables with Kabelverschraubungen	Jannick	Parts of order arrives	Still in Progress
Start to implement motorprocess RPM function for cayenne GUI	Edwin and Jai	Next Meeting	Still in Progress

Type of session / Protocol type	**Development project MYiTOPS team meeting**		
Date of the session	15.06.2020		
Start/end	10:00 -		
Type of communication	Skype		
Record keeping	preparation		
Attendees	Daria Masny-Kulak ☒ Johannes Keßler ☒ Jin Yun Ng ☒ Alyxie Anthony ☒ Jannick Ungerer ☒	Hussein AL-Faiz ☒ Lujaini ☒	
Guests	Supervisor Ferhat Aslan, Danial Harris		

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin	Jannick Alyxie Hussein	Jai Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

- Discussion for toolless adjustments of the Arms (Daria idea)
- Discussion for Failsafe, Absturzsicher (Johannes idea)
- Discussion Softwaresicherung Github – account?

Nr. 2: Collection of ideas

- Meeting in persona for the next week
- Layout with some tools is still ok
- Clear up communication of requirements with customer

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
working together solving autostart problem	Daria, Edwin, Ferhat	22.06.2020	Done
Try to Debug program	Edwin	After meeting	Done
failsafe, motorprocess	Edwin, Jai, Johannes	Next meeting	Carried to next protocoll
Scaffolding of documentation	Daria	Next meeting	Done
Organisation of transparent sticker and bring it with you on monday	Daria	Next meeting	Done
Documentation of seperat chapters	Everyone to the special part	When scaffolding is ready	Carried to next protocoll
Fix Parts & boards in printed Box	Hussein	Parts of order arrives	Done
Measure and print cable-cover (3D printed)	Hussein	Next Meeting	Improved
Continue GANTT-chart	Alexei	Next Meeting	Improved
Try to run GPRS module	Johannes	Next meeting	modem broken
Adjust Actors, change Nutensteine, Cables with Kabelverschraubungen	Jannick	Parts of order arrives	Carried to next protocoll

Type of session / Protocol type	**Development project MYiTOPS team meeting**			
Date of the session	24.06.2020			
Start/end	17:00 – 18:00			
Type of communication	In Person			
Record keeping	Johannes Keßler			
Attendees	Johannes Keßler Jin Yun Ng Alyxie Anthony	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒ ☐ ☐ ☐
Guests	Supervisor Ferhat Aslan, Danial Harris			

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin	Jannick Alyxie Hussein	Jai Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

- Check hardware stability by Customer (Ferhat)
- SIM-Modem problem

Nr. 2: Collection of ideas

- "offical" presentation by video
- "inoffical" presentation by hand-over all stuff to Ferhat in mid of august
- Focus on motorprocess data instead of SIM Module. Connection of RPi by Hotspot (Smartphone, Wlan, ...)
- Make an understandable documentation for customer/ user/ MYiTops 2021

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
failsafe, motorprocess data	Edwin, Jai, Johannes	Next meeting	Still in progress
Leadership of Documentation	Daria	Until presentation	Still in progress
Documentation of seperat chapters	Everyone to the special part	Until presentation	Still in progress
3D print cable-cover	Hussein	Next Meeting	Done
Continue GANTT-chart	Alexei	Next Meeting	Done
Collect presentation material from everyone	Alexei	End of his exams ~16. 7	Still in progress
Adjust Actors, change Nutensteine, Cables with Kabelverschraubungen	Jannick	AS SOON AS POSSIBLE	Done

Type of session / Protocol type	**Development project MYiTOPS team meeting**			
Date of the session	21.07.2020			
Start/end	16:00 – 20:00			
Type of communication	Meeting at the "Lab"			
Record keeping	Johannes Keßler			
Attendees	Johannes Keßler Jin Yun Ng Jannick Ungerer	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒ ☐ ☐ ☐
Guests				

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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Group 1	Group 2	Group 3
Daria Edwin	Jannick Alyxie Hussein	Jai Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

- New Meeting with everyone
- Check actual state after the exam phase

Nr. 2: Collection of ideas

- Making a movie instead of a user manual
- Timeout
- Run new motherboard

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Troubleshooting of new motherboard	Jai, Edwin	Monday, 27.7.	Still in Progress
New Sticker without spelling mistake for acryl- box-top	Johannes, Daria	Monday, 27.7.	Still in Progress
Organize new parts	Jannick	Monday, 27.7.	Done
Think about video manual	Jannick, Alexei	Monday, 27.7.	Done
Print new Box Version II	Hussein	Monday, 27.7.	Done

Type of session / Protocol type	**Development project MYiTOPS team meeting**			
Date of the session	27.7.2020			
Start/end	13:00 – 20:00			
Type of communication	Meeting in the "Lab"			
Record keeping	Johannes Keßler			
Attendees	Daria Masny-Kulak Johannes Keßler Jin Yun Ng Alyxie Anthony Jannick Ungerer	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒
Guests				

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
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Group 1	Group 2	Group 3
Daria Edwin	Jannick Alyxie Hussein	Jai Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

- Distribution of Documentation and Presentation tasks
- Video Manual
- Failsafe/ Timeouts Cayenne
- Motorprocess Data Cayenne

Nr. 2: Collection of ideas

- Daria can manage Plakat from home
- Jannick is going to vacations at beginning of August -> Alexei cuts video
- Timout by time for motorprocess, no timeout for calibration but secured functions

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Troubleshooting of new motherboard	Jai, Edwin	Next meeting	Done
Print acryl-sticker	Daria	Next meeting	Done
Test run of timout and motorprocess function	Jai, Johannes, Edwin	Next meeting	Done
Prepare poster layout (required by HsKA)	Daria	Next meeting	Done
Documentation to subthemes: Write down in prepared scaffolding from Daria	Individual	Until monday before Presentation	Still in Progress
User manual Video production	Alexei, Jannick	Until monday before Presentation	Still in Progress
Insert Data into the scaffolding of the Presentation	Johannes	Until monday before Presentation	Still in Progress
Timeout	Daria	Next meeting	Done

Type of session / Protocol type	**Development project MYiTOPS team meeting**			
Date of the session	10.08.2020			
Start/end	10:00 – 12:00			
Type of communication	Jitsi			
Record keeping	Johannes Keßler			
Attendees	Daria Masny-Kulak Johannes Keßler Jin Yun Ng Alyxie Anthony Jannick Ungerer	☒ ☒ ☒ ☒ ☒	Hussein AL-Faiz Lujaini	☒ ☒ ☐ ☐ ☐
Guests	Supervisor Ferhat Aslan, Danial Harris			

Nr.	Topic:	Who	Description
1	Goal setting	all	DE
2	Collection of ideas	all	D
3	Planning for the next meeting	all	S
4			
5			
6			
7			
8			
9			
10			

DE = decision, D = discussion, I = information, S = standard TOP

Group 1	Group 2	Group 3
Daria Edwin	Jannick Alyxie Hussein	Jai Johannes
⇨ Programming ⇨ Raspberri Pi connection ⇨ Documentation	⇨ User Manual Video ⇨ Mechanical- and Electrical Components	⇨ Data Server ⇨ Budget Plan ⇨ GUI (Interface)

Nr. 1: Goal setting

- Status quo of the chainsaw system
- Mock-up-Presentation at Bruchsal next week

Nr. 2: Collection of ideas

- Delegate chapters of documentation
- Final Layout ideas for presentation
- Strategy of speakers for presentation: everyone got 4 minutes
- Another few video takes for User Manual
- Find error of RPM-loopback from Chainsaw to Cayenne

- **Next meeting will be Monday, 9 AM at the Lab**

Nr. 3: Planning for the next meeting

Task	Who?	Until when?	Done?
Send layout for mechanic	Hussein	Friday evening	Done
Send layout for electric	Jai	Friday evening	Done
Send layout for GUI	Edwin	Friday evening	Done
Send layout for Python Code	Daria	Friday evening	Done
Take Video Clips and send them to Alexei	Edwin, Jai	Saturday evening	Done
Finish the whole Video during his quarantine	Alexei	Until 21.08 Presentation	Done
Budget List into documentation	Johannes	Meeting Monday	Done
Cayenne function Table into documentation	Edwin	Meeting Monday	Done
Add protocolls into the documentation	Daria	Meeting Monday	Done
Write everything possible into the documentation	everyone	Meeting Monday	Done
Insert Data into the scaffolding of the Presentation, preparation of mockup Presentation	Johannes	Meeting Monday	Done
Bring MYiTOPS-stickers to mockup	Daria	Meeting Monday	Done
Troubleshooting for the RPM-data from Chainsaw	Edwin, Jai	Meeting Monday	Done

13. LIST OF SOURCES

[1] "Data types for Cayenne MQTT API," *myDevices Cayenne Community*, Jun. 13, 2017. https://community.mydevices.com/t/data-types-for-cayenne-mqtt-api/3714 (accessed Aug. 15, 2020).

[2] ibslmzFollow, "Cayenne, Python and MQTT Tutorials-1 - Digital Input," *Instructables*. https://www.instructables.com/id/Cayenne-Python-and-MQTT-Tutorials-Digital-%C4%B0nput/ (accessed Aug. 15, 2020).

[3] ibslmzFollow, "Cayenne, Python and MQTT Tutorials-2 - Digital Output," *Instructables*. https://www.instructables.com/id/Cayenne-Python-and-MQTT-Tutorials-2-Digital-Output/ (accessed Aug. 15, 2020).

[4] "09_phak_ch7.pdf." Accessed: Aug. 19, 2020. [Online]. Available: https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/09_phak_ch7.pdf.

[5] 3DHubs, "Introduction to FDM 3D printing," *3D Hubs*. https://www.3dhubs.com/knowledge-base/introduction-fdm-3d-printing/ (accessed Aug. 13, 2020).

[6] Rigid.Ink, "How to Use 3D Print Infill Settings - Increase Strength, Save Filament." https://rigid.ink/blogs/news/optimum-infill (accessed Aug. 13, 2020).

[7] All3DP, "PLA vs ABS – Filaments for 3D Printing Compared | All3DP," *All3DP*. https://all3dp.com/1/pla-vs-abs-filament-3d-printing/ (accessed Aug. 13, 2020).

[8] All3DP, "PLA vs. ABS: What's the difference?," *3D Hubs*. https://www.3dhubs.com/knowledge-base/pla-vs-abs-whats-difference/ (accessed Aug. 13, 2020).

14. LIST OF FIGURES

15. SIGNATURES

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Daria Masny-Kulak

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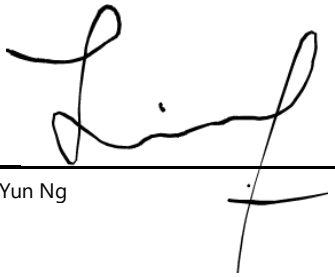
Muhammad Lujaini

X 

Jin Yun Ng

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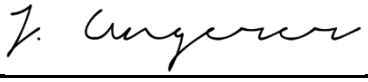
Alyxie Anthony

X 

Jannick Ungerer

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Johannes Kessler

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Hussein Al-Faez