

CamperVan Control Unit system design

Introduction

While building my own van I came across multiple challenges in both domains technical and logistics. Of course the main issue was the cost of the components that I wanted to purchase ;) That's why I started to build my own parts for it. I graduated robotics with a strong software focus, so the obvious direction for me was to develop my own control board. There are a couple of off the shelf options, but none of them suit me well. Also designing a product from scratch that I see a specific use case for is fun.

First let's discuss market available options:

1. <https://cbe.it/en/Standard-products/New-technology/Control-panels>
2. <https://simarine.net/via/>
3. <https://www.garmin.com/en-US/p/716468>
4. <https://www.garmin.com/en-US/p/861146/pn/010-02764-00>
5. <https://www.garmin.com/en-US/c/marine/digital-switching/>

The rough price for such a system (central unit and display) can be between 200 and 1000 euro, so I have some room to play with.

The main functions I want to implement and I believe are important for the end user:

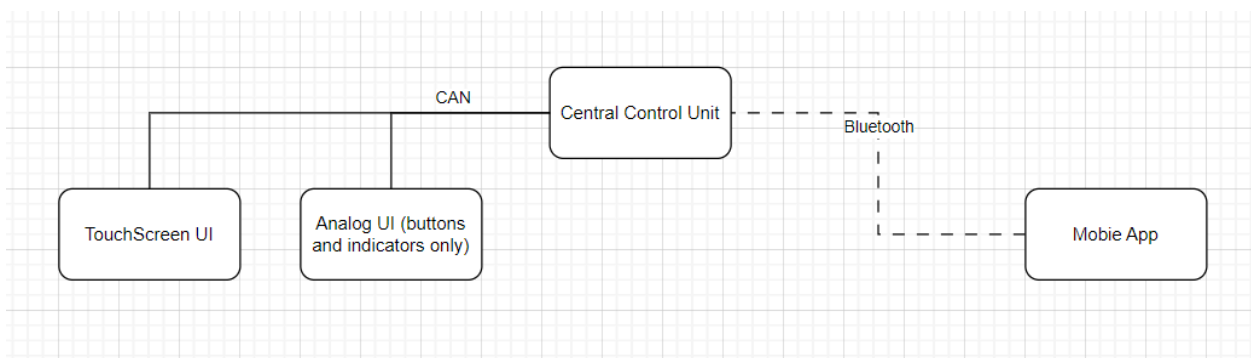
1. Enable user to switch power for multiple loads
2. Provide safety for 12V power distribution system
3. Enable user to control the system from multiple places (front and rear of the van, smartphone)
4. Grid connection detection so the system can change behaviour when there's free power from the grid.
5. Provide intelligent lightning control (change of brightness, ideally color for mood-based scenarios)
6. Monitor core parameters like:
 - 6.1. temperature outside
 - 6.2. temperature inside
 - 6.3. Main Battery State of Charge
 - 6.4. Water left in main tank
 - 6.5. Grey water tank status (if full)

Other, more generic parameters that are important:

- Ease of Use for the user
- Ease of installation
- Low price
- Small size
- Low power consumptions

System Design

Now based on the identified requirements let's discuss specific features and components of the system.



1. Central Control Unit

This will be the main part. All high-power connections as well as smaller loads and sensors should connect to it. This part can be mounted in inaccessible places, so another device for user interaction is required.

2. TouchScreen User Interface

Digital LCD based panel gives the most flexibility, but also requires the most work.

3. Analog User Interface

This option for user interface is the easiest to implement, so will be the cheapest. However it's difficult to allow users to control all the features implemented in the Main Control Unit. This will be the minimal version allowing only to switch loads, display battery level and some binary indicators.

Implementation

From the implementation perspective there are 3 parts:

1. Software:
 - a. Embedded development
 - b. User interface development
 - c. Mobile App (optionally)
2. Electronics:
 - a. Main Control Unit PCB design
 - b. Analog UI PCB design
 - c. TouchScreen module will be purchased as a ready module
3. Hardware:
 - a. Simple 3d-printed enclosures
 - b. Off the shelf buttons

This repo is split in this way too. So please check out the part that interests you the most ;)