PATIENT MONITORING SYSTEM - PMS

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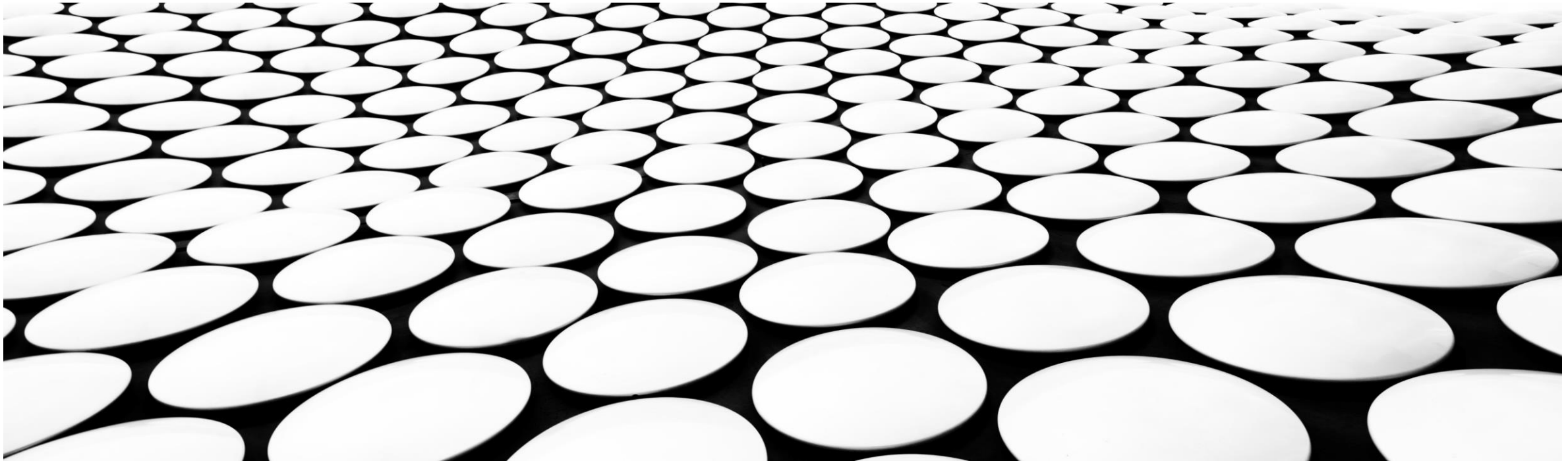


TARGET GROUP – PATIENT CHARACTERISTICS

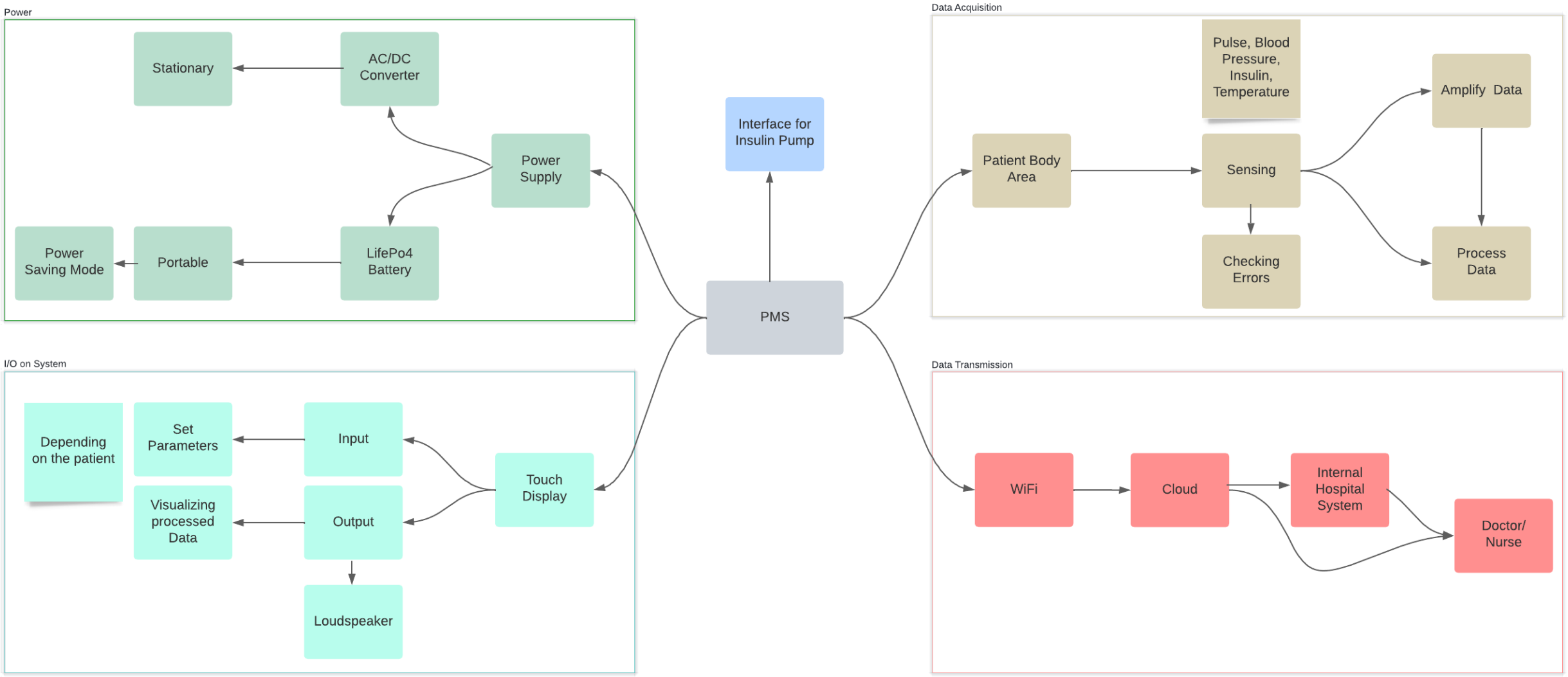
- The PMS is tailor-made for older people which suffer of diabetes and/or high blood pressure
- Type 2 diabetes results from the body’s ineffective use of insulin - 95 percent have type 2 diabetes
- constant hunger, weight loss, vision changes, and fatigue may occur suddenly

PATIENT NEEDS BASED ON PERSONAS

- Affected people are worried about that diabetes will control their life
- Afraid of missing a worthy life because they always need to pay attention on their insulin levels
- Many people also do not have the time to go frequently to the doctor
- Data tracking for more differentiated diagnosis

OVERVIEW OF THE CONCEPT

- The PMS is portable and stationary usable
- if used portable a power saving mode is activated to increase battery life -> will deactivate the data transmission
- back-light of the screen is adjusted depending on the ambient light
- touch display for visualizing data and for entering parameters
- loudspeaker should mainly act as an alarm
- sensing the pulse, blood pressure, glucose levels and temperature
- data is transmitted via WiFi into a cloud
- interface for an insulin pump

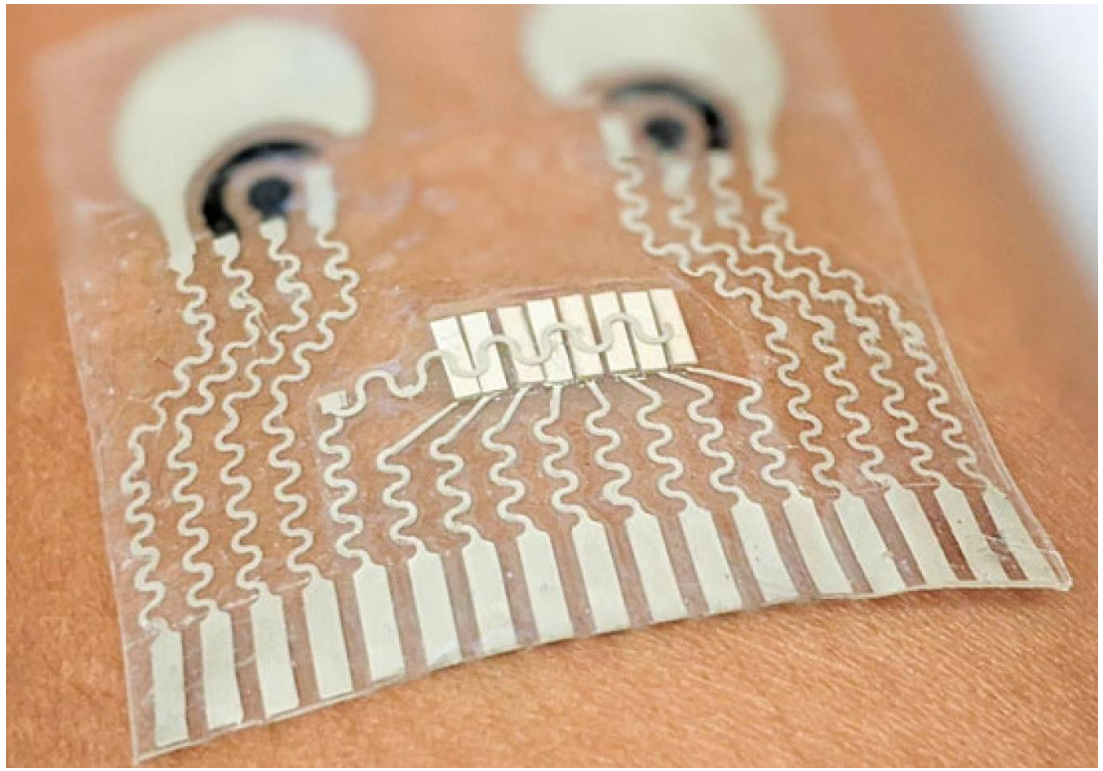

Power
Stationary
AC/DC Converter
Power Supply
Power Saving Mode
Portable
LifePo4 Battery
Interface for Insulin Pump
PMS
Data Acquisition
Pulse, Blood Pressure, Insulin, Temperature
Amplify Data
Patient Body Area
Sensing
Checking Errors
Process Data
I/O on System
Depending on the patient
Set Parameters
Input
Visualizing processed Data
Output
Touch Display
Loudspeaker
Data Transmission
WiFi
Cloud
Internal Hospital System
Doctor/ Nurse

IMPORTANT REQUIREMENTS

- Security for Personal Data - cryptographic functions are needed to protect data transferred to, from, or stored within the personal healthcare monitor
- Power Efficiency - the active time of high-power functions should be minimized as much as possible
- Comfort - not too big or heavy in order to not restrict the patient in any ways, big enough screen so that also old people can read the information and battery should last long enough

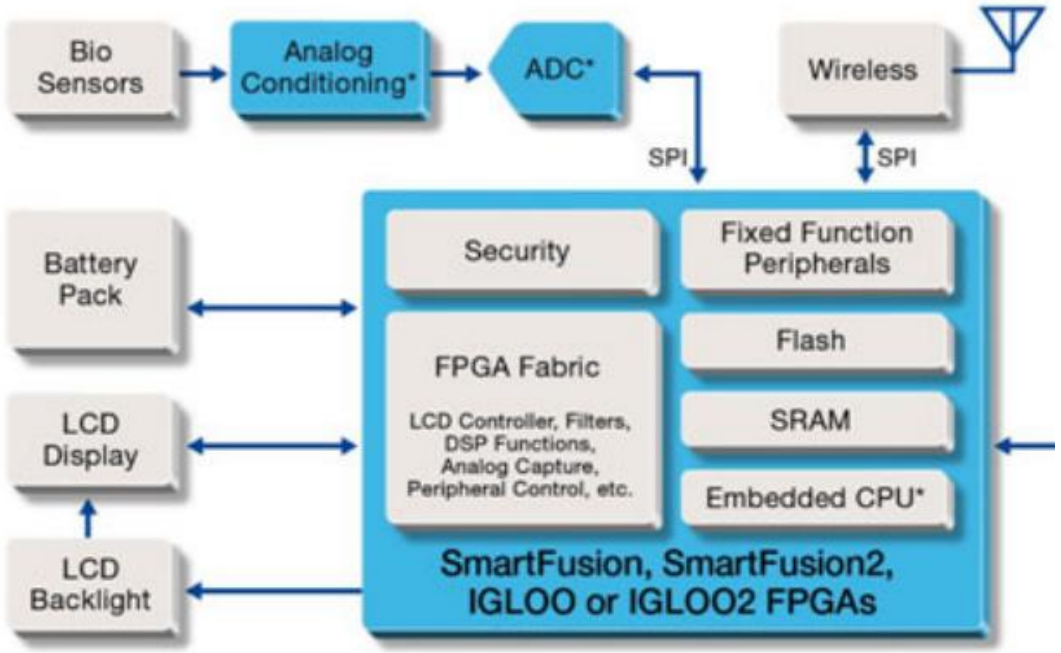
HARDWARE FOR SENSING VITAL PARAMETERS

- soft, stretchy skin patch that can be worn on the neck to continuously track blood pressure and heart rate
- developed by engineers at the University of California
- great comfort compared to individual sensors distributed on the body
- Photoresistor for detection of the intensity of the ambient light



PROCESSING UNITS

- SoC from Microsemi called „Smart Fusion“
- FPGAs are cheap, very fast with custom programming, flexible and reprogrammable after installation



POWER SUPPLY

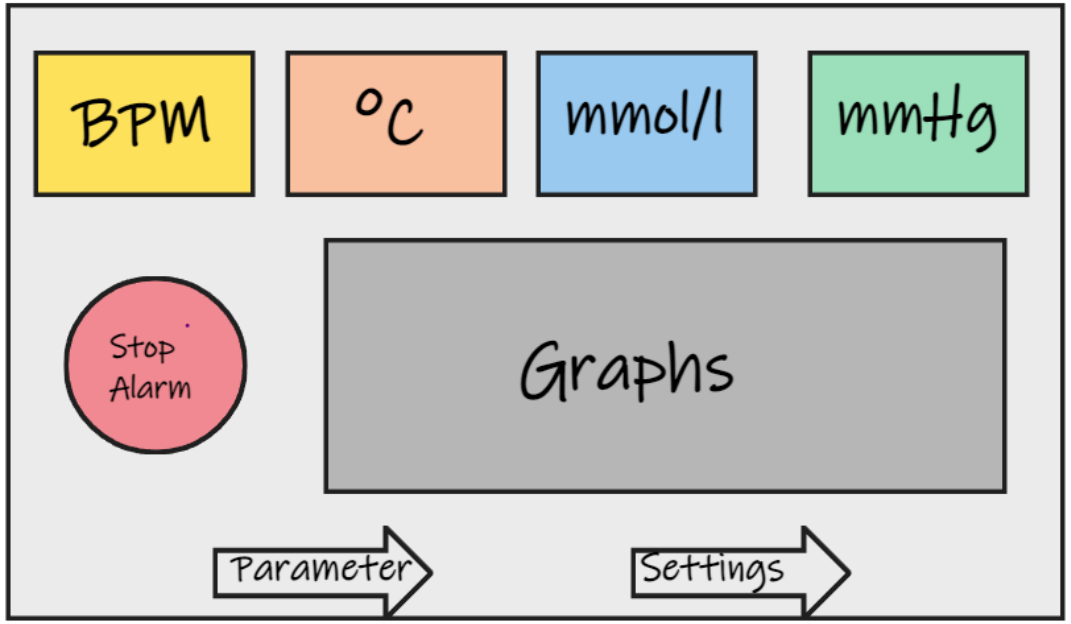
- Common AC/DC chargers for smartphones with enough power
- Battery chemistry type is LiFePO4 since it is one of the safest battery types - very good energy to weight ratio and lifetime
- For cell balancing and protection a suitable battery management system is needed

DATA TRANSMISSION AND STORAGE

- low power WiFi module - Sterling-LWB+ with fully featured WiFi 4
- easy integration with any Linux or Android based system
- In order to map the data to the belonging patient a unique ID is provided
- hard disk is used to store data locally on the device

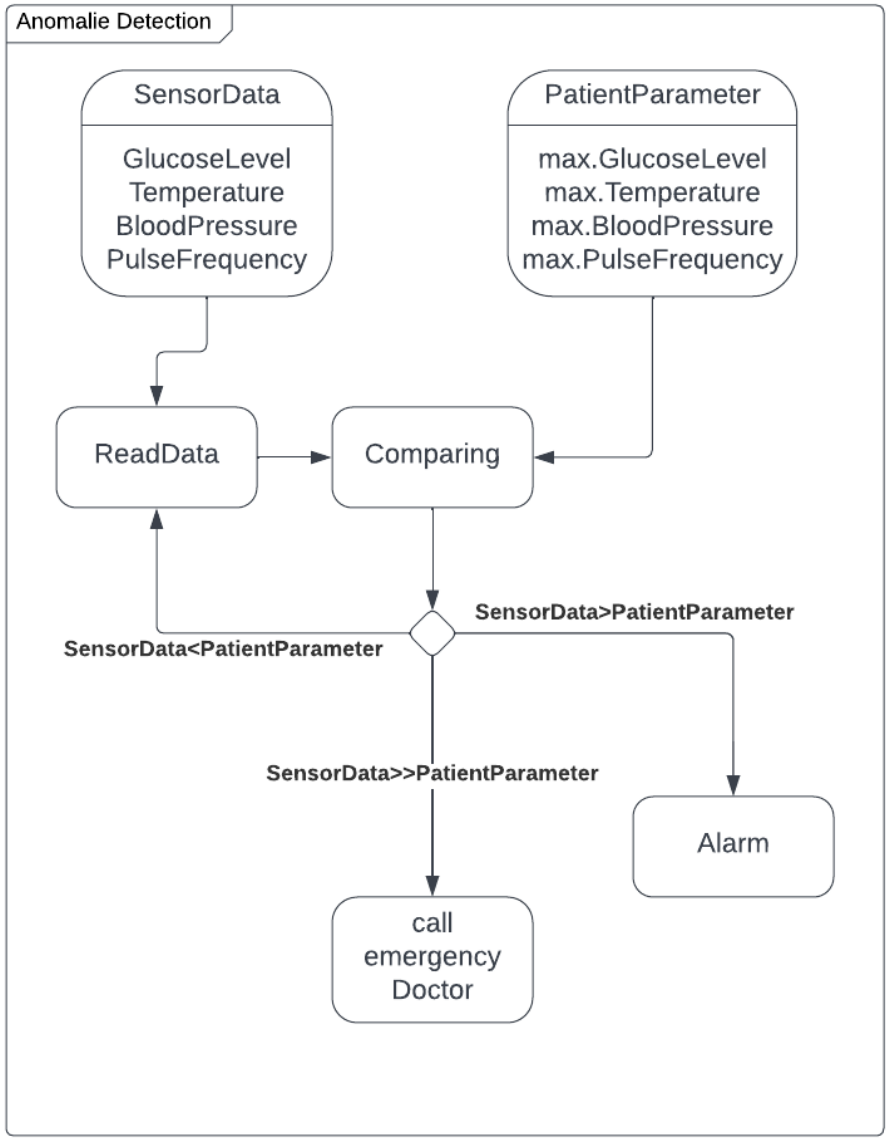
USER INTERFACE

- LCD-Touch-Panel - 7inch with a 16:9 ratio - low cost and good power efficiency
- big text-boxes in different colors for each parameter (Glucose Level, Blood Pressure, Temperature, Pulse Frequency) updates every 5 seconds
- graphs with different colors matching them of the text boxes show the history of the parameters (same page or on a second page)
- If a parameter reaches an abnormal value, the corresponding text box will start blinking
- patient can change the size and position of different text-boxes
- In case of a false alarm because a sensor is not working properly or external interference, the patient can turn of the alarm



ALARMING FOR VITAL SCENARIOS

- Unique alarm sounds if a parameter is reaching a level which is threatening
- For the case that a parameter is way higher or lower than the reference parameter so that it could be life threatening the PMS will spell the words ”call an emergency doctor”
- Also advises on how to help the patient as a normal person are shown on the display



DISCUSSION AND CONCLUSION

- complexity of such a system is huge
- to develop a market ready PMS a team of electrical, electronic and software engineers must work closely together
- long and intense testing phase since the data it shows must be very reliable
- PMS has a very minimalistic though sufficient UI which can be personalized
- PMS consists of several alarm mechanisms
- interface for connecting an Insulin Pump which can actively control the glucose level of the blood

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THANKS FOR YOUR ATTENTION!