B.4 Activity Classification with the Thingy:52

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AIM (KPI) :

1. Record data continuous and successfully
2. Process data and collect data for machine learning
3. Machine learning model performance
   - Accuracy
   - Sensitivity
4. Real time recognition
5. Real time data storage and visualization through web dashboard

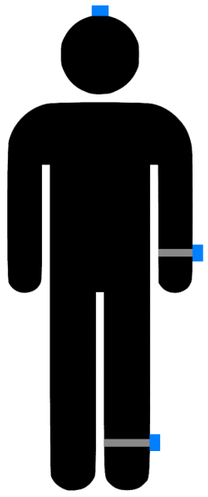
System Overview:

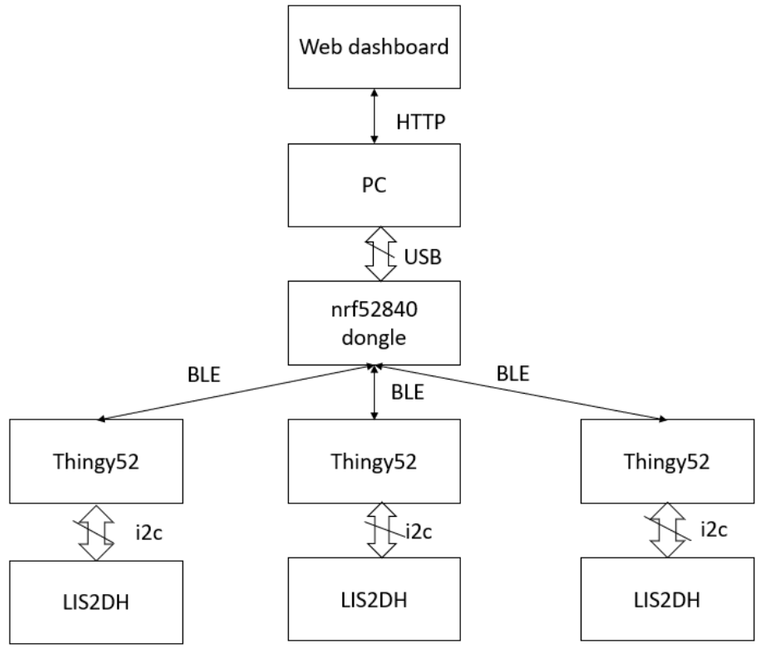
Three thingy52 are used to collect accelerometer data of the user. Each will be put on user's following body parts as shown:

- Top of head
- Left wrist
- Left leg

Thingy52s are connected to dongle through Bluetooth connection, which is then connected to PC through serial.

Once the sensor data is collected, machine learning algorithms will be used to classify the movements such as sitting, standing, walking or running. After the physical activities are classified by machine learning, the data will then be displayed on the GUI and pushed to web dashboard.





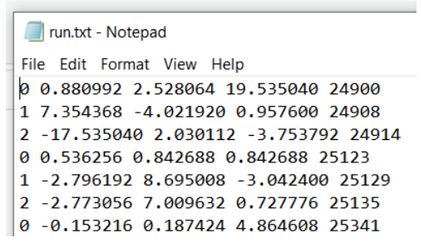
Conclusion:

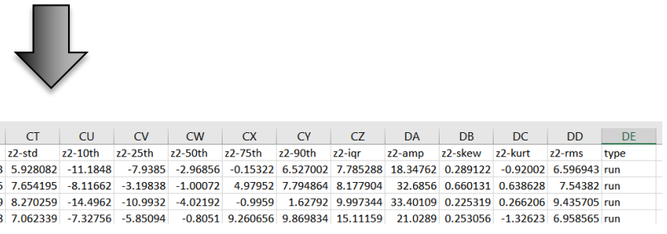
- Data can be received from Dongle through serial.
- Data is updated every 200ms
- PC software will process the data and calculate the features
- The human physical activity can be classified through three thingy52s by KNN
- Classified activity is updated in real time and displayed on GUI (take 3-4 seconds to be stable for activity transition)
- Classified activity is updated to web dashboard viewer every 3 seconds

- Machine Learning:

Collected activity data

Calculated features in time domain (every 30 datasets – 6s period) as training data





:Q	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE
urt	y2-rms	z2-mean	z2-std	z2-10th	z2-25th	z2-50th	z2-75th	z2-90th	z2-iqr	z2-amp	z2-skew	z2-kurt	z2-rms	type
32389	9.549359	-3.09013	5.928082	-11.1848	-7.9385	-2.96856	-0.15322	6.527002	7.785288	18.34762	0.289122	-0.92002	6.596943	run
07276	11.47136	0.524805	7.654195	-8.11662	-3.19838	-1.00072	4.97952	7.794864	8.177904	32.6856	0.660131	0.638628	7.54382	run
36948	9.427308	-4.78699	8.270259	-14.4962	-10.9932	-4.02192	-0.9959	1.62792	9.997344	33.40109	0.225319	0.266206	9.435705	run
51234	11.35462	0.455578	7.062339	-7.32756	-5.85094	-0.8051	9.260656	9.869834	15.11159	21.0289	0.253056	-1.32623	6.958565	run

- GUI:

Detect available serial port

Start and end the process