MIDDLE EAST TECHNICAL UNIVERSITY

ELECTRICAL & ELECTRONICS ENGINEERING

Weekly Report 13

EE 494

Cat Feeding Project

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1 Identification

1.1 Procedures and Test Methods

This week is dedicated to critical report writing and tests for the report. Because of data shortage, data generation techniques are developed. Pictures are taken from Raspberry Pi camera from the computer screen with many many samples so that any noisy data can be eliminated with this huge data size. Total of approximately 300 photos are taken with the camera for 3 classes (different cats); however, Pi camera has broken at this process since no protective case or equipment present at the process. Therefore, only 3 different classes created. Because of the small size of samples, it is decided to search internet so that find more samples in case of this biased approach. 17 different cats, with 5 images per cat on average is downloaded. Therefore, 2 different data sets are created, and a third one; the hybrid data set is formed. Data sets can be represented as A, B, and C for which A stand Pi camera data set, B is Facebook data set, and C is the hybrid one.

The tests are done in different ways. Only train and test sets are considered and default parameters for the algorithms are assumed, for SIFT it is given in listing 1.1. Data sets are formed in the following ways :

- **Dataset 1 :** 5 test samples for each class, remaining train samples in data set A
- **Dataset 2 :** 1 train sample for each class, remaining test samples in data set A
- **Dataset 3 :** 1 test sample for each class, remaining train samples in data set B
- **Dataset 4 :** 1 train sample for each class, remaining test samples in data set C

```
int             nfeatures = 0,
int             nOctaveLayers = 3,
double          contrastThreshold = 0.04,
double          edgeThreshold = 10,
double          sigma = 1.6
```

1.2 Test Results

The results vary greatly among data sets. This is due to two different reasons, the first one is the varying nature of camera. In Facebook data set, different cameras are used and background in these images are distinct. On the other hand, data set

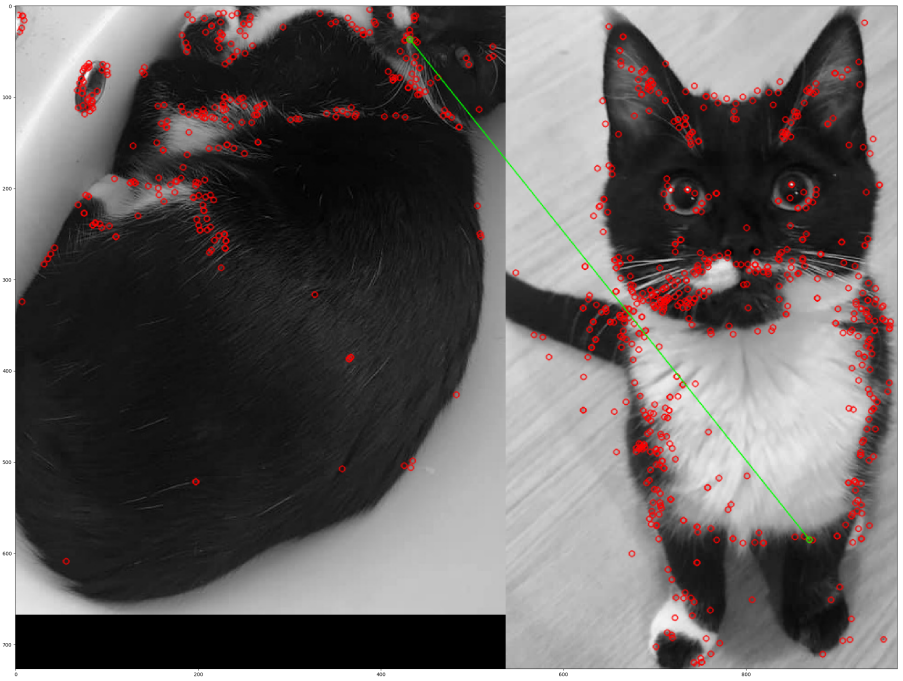

Figure 1: Sample Images in Facebook Data Set

Confusion Matrix					
		Predicted			
		Cat 1	Cat 2	Cat 3	Cat 9
Ground Truth	Cat 1	5	0	0	0
	Cat 2	0	5	0	0
	Cat 3	0	0	5	0
	Cat 9	0	0	0	5

Figure 2: Confusion Matrix for Set 1 - Test 1

B is taken with a single camera and background is extracted from these pictures. The second reason is that cat photos taken in Facebook data set are mostly taken in unrelated view points such as given in figure 1. Therefore, their performance is apparently lower.

Unfortunately, accuracy results vary too much between samples. Database A and C give perfect results whereas B gives really poor results. Figure 2 and 3 shows the confusion matrices for the data set B and A respectively. On the other hand, figure 4 shows the accuracy results for data set C. Note accuracy is 1.0 for figure 3 and 0.3125 for 2 which is because of the reasons explained above.

Confusion Matrix																
		Predicted														
		Selin	Seda	Melis	Haza	Ezgi	Esra	Esr	Ekin	Dilara	Ceren	Bahar	Ase	Cem	Deniz	Ezg
Ground Truth	Selin	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Seda	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Melis	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Haza	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Ezgi	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Esra	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Esr	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Ekin	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Dilara	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Ceren	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Bahar	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Ase	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Cem	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Deniz	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
	Ezg	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

Figure 3: Confusion Matrix for Set 2 - Test 2

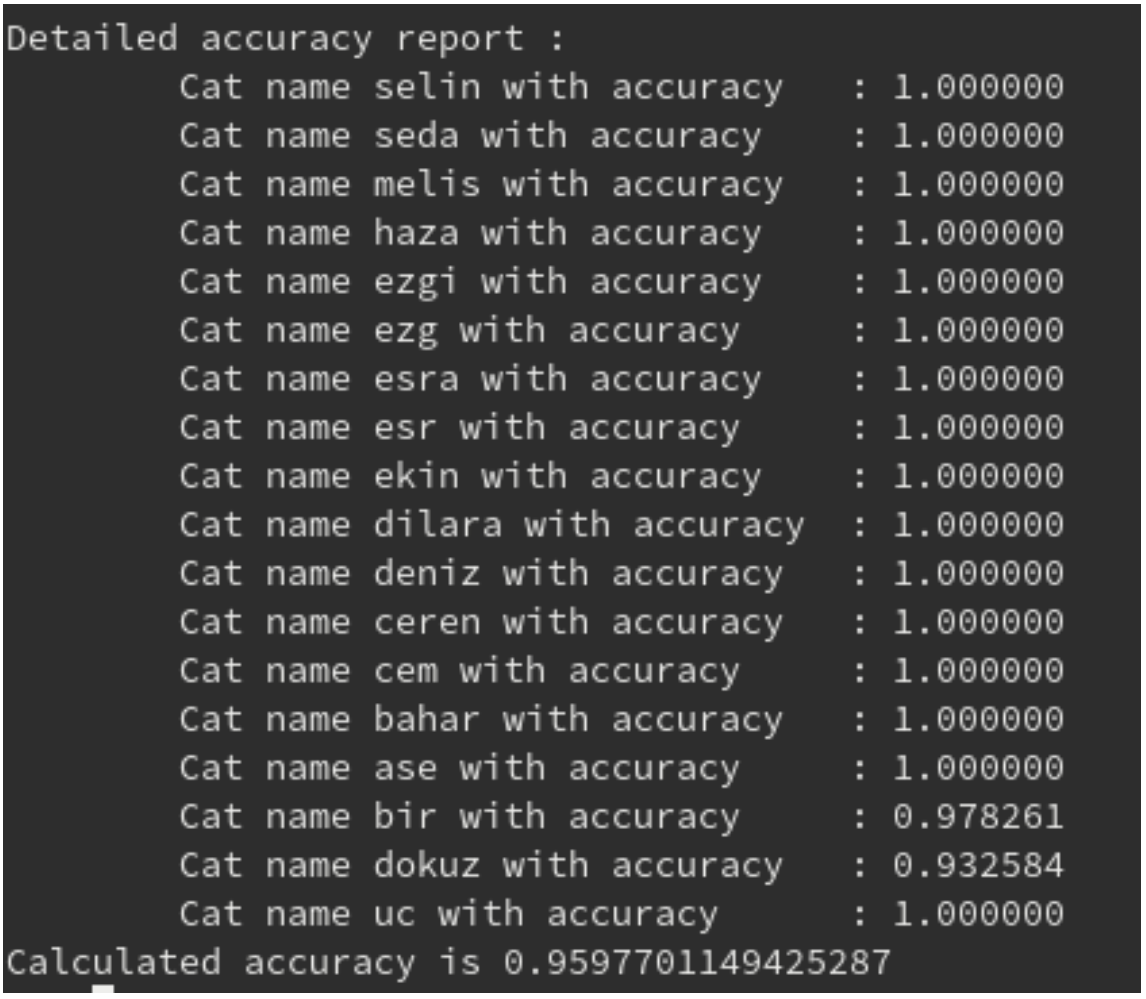

Figure 4: Accuracy Tests with New Cats to the System

2 Electronics

The design of the supply unit is finalized and tested. Final design is shown in Figure5. Raspberry Pi, Arduino, and servo motor sub-units work properly while the system is supplied from the batteries, and the system is being charged.

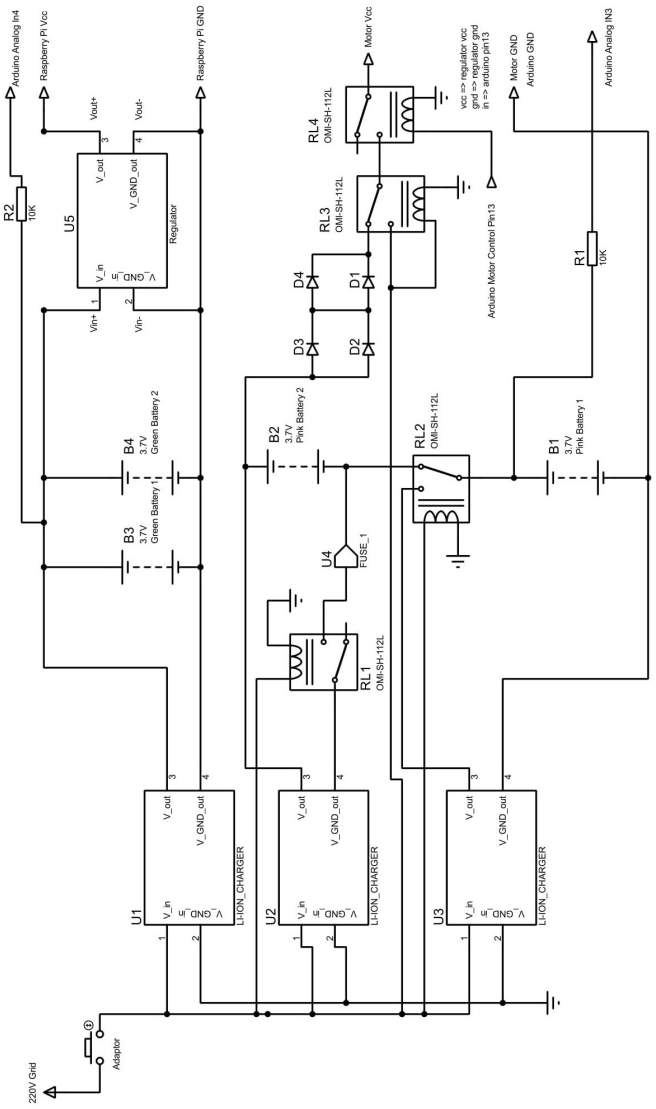

Figure 5: Circuit Schematic of the Supply Unit

3 User Interface

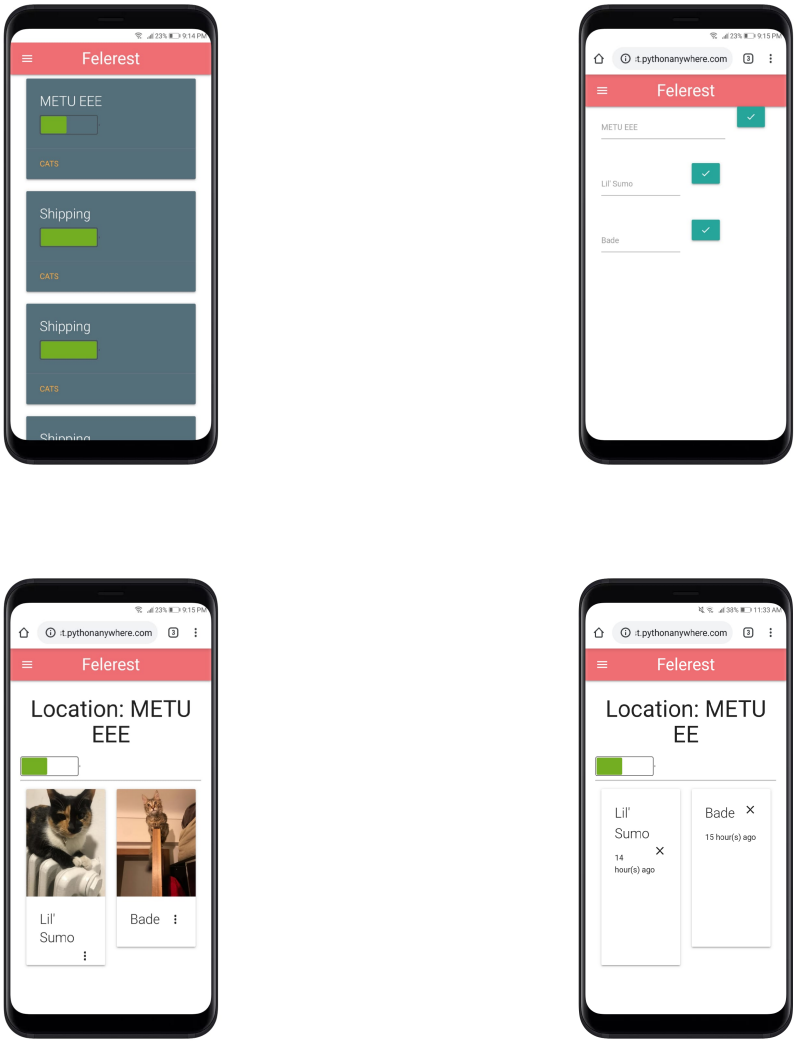

Figure 7: User Interface Screenshots

Following requirements were implemented:

- Device's battery level during charging
- Device's battery level during operation
- Cats' profiles

4 Future Work

- More data collection for identification process optimization
- Train - Validation - Test sets implementation and hyper-parameter optimization
- Creating class structure for identification (week after next)
- Integrating identification to the main part (week after next)

References