Detection of Constellations in Astronomical Images

University of Malta

Faculty of Information & Communication Technology

Bachelor of Science in Information Technology (Honours) (Artificial Intelligence) 2nd Year

ARI2201 – Individual Assigned Practical Task

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# Introduction

The main objective of this assigned practical task is to create a software which can recognize set constellations in images which are noisy and blurry. This will be done using computer vision and template matching.

Many different types of software have been created to do the task assigned above, some of them being “Star Walk 2”, “Star Tracker” and “SkyView”. These apps generally have very similar functionality: using the rear camera of a phone as a live feed and identifying constellations, stars and planets based of the location of the user as well as the video feed. While many apps have been created, not much academic research has been carried out regarding the best techniques involved to recognize constellations efficiently and with the highest accuracy.

Through this assigned task, the best techniques involved in identifying constellations in images will try and be identified. The techniques which will be tested are template matching using computer vision as well as taking on a more machine learning based approach and testing recognition with a convolutional neural network.

Another obstacle in creating tests is the lack of a database of constellations as well as images containing the constellations. Since there is no dataset with the information required to find the best techniques in constellation identification, the dataset will be created using the software “Stellarium”. This software allows for the tracking and identification of constellations while also allowing the user to turn off any labels in the images which might influence any machine learning or template matching. The turning off of labels is vital in the success of the task required as in a real-life scenario, there are no labels in the sky which our phone is able to match to.

This assigned task will be split into two tasks: building the dataset and recognizing the constellations. At the end of this task, the software developed will be able to successfully identify ten different constellations with a certain degree of accuracy.

As mentioned, the dataset will be created using the software “Stellarium”. For each constellation which will try to be identified, two photos will be extracted from the software; a general empty photo with the constellation in the image as well as a “template” image which will be a photo containing only the constellation. Since two photos is not enough to build a database, each empty photo will have a random amount of blur and salt-and-pepper noise added to it to simulate as though the photo was taken by a user. Each empty photo will generate five versions of the original photo with the added blur and noise to build the dataset.

# Research

# Implementation

## Testing

# Evaluation and Critical Analysis

# Conclusion

# References