Hand gesture recognition in industry

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1 Description

1.1 Project

The purpose is to write a program to recognize various hand gestures and combinations of hand gestures. Theses hand movements will be recorded by a camera and sent to a computer. The computer will then analyse it and tell which one of the recorded gesture the camera is seeing or that the gesture is not yet recorded in the database. In order to recognise the gesture, the skeleton of the hand will be calculated. An interface will be created to use this program.

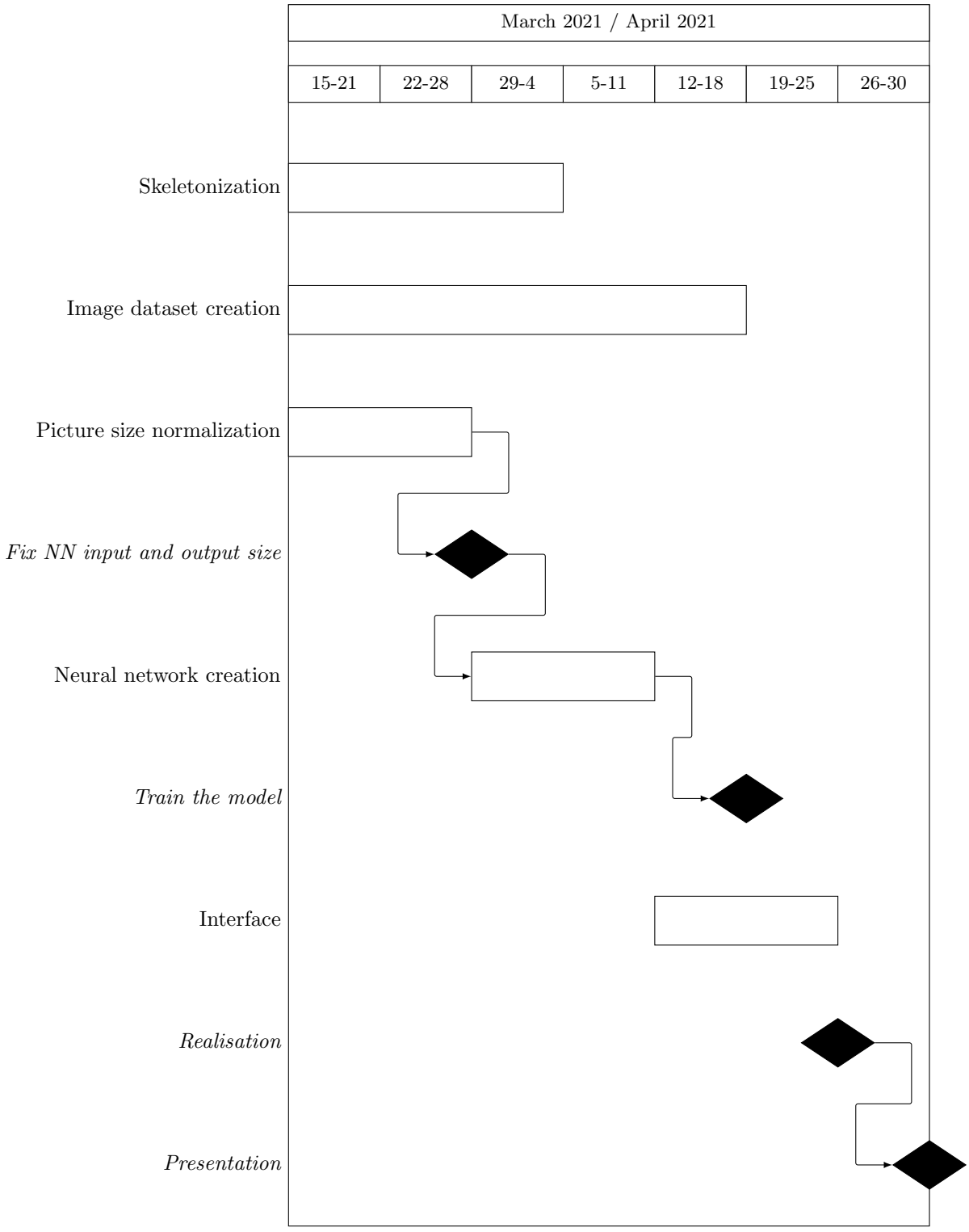
1.2 Interface

The interface will show the live feed from the camera and the picture that was taken by the camera to be analysed. It will also give the possibility to add a new hand position. A visualisation of the skeleton that was understood by the computer from the newly added gesture will then be shown. The possibility for the user to visualize every gesture that have been recorded and to delete a gesture will be given.
On the prototype of the interface, there will be a button to activate and deactivate the camera. However, on a more finished project, the camera could be managed by a motion sensor for example.

1.3 Required equipment

- To record the hands gesture, we need a camera.
- A database of gesture that we want to recognise
- A model to locate a hand on a picture
- A computer and a screen

2 Gantt diagram



3 State of the art

Multiple techniques are developed since the early 2000. One technique [1] is to divide the hand in palm and fingers. Then we can count how many fingers are on the picture.
Another technique is to identify the skeleton of the hand to do the classification on this skeleton.
[2] explains the step to process an image into creating a skeleton of that image. It also speaks about the static and dymanic hand gesture recognition.
[3] is the thesis of a PHD student, he developed with great explanation an algorithm to create the skeleton of a shape with the Voronoï diagram. He also explained different algorithm with their pros and cons. Both of them create the skeleton from an image taken in the best condition possible. The hand or the object is positioned in front of an uni-color wall. The picture is then filtered to create a clear contrast between the object and the wall. However this technique cannot be used in a real life application, an algorithm to isolate the hand in the image would be necessary.
Theses two articles were written in 2004 and 2009. The techniques that are explained might be outdated but we weren't able to find more recent articles that were available for free.

References

[1] Zhi-hua Chen, Jung-Tae Kim, Jianning Liang, Jing Zhang, Yu-Bo Yuan, 2014, *'Real time hand gesture recognition using finger segmentation'* ,view at Hindawi

[2] Bogdan Ionescu, Dider Coquin, Patrick Lambert, Vasile Buzuloiu, 2004, *'Dynamic hand gesture recognition using the skeleton of the hand'*, Eurasip, view at link.springer.com

[3] Andoni Beristain Iraola, 2009, *'Skeleton based visual pattern recognition: applications to tabletop interaction'*, PhD thesis, The University of the Basque Country, Spain, view at ehu.eus