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The CORSMAL challenge

Team 2

Object dimensions estimation module

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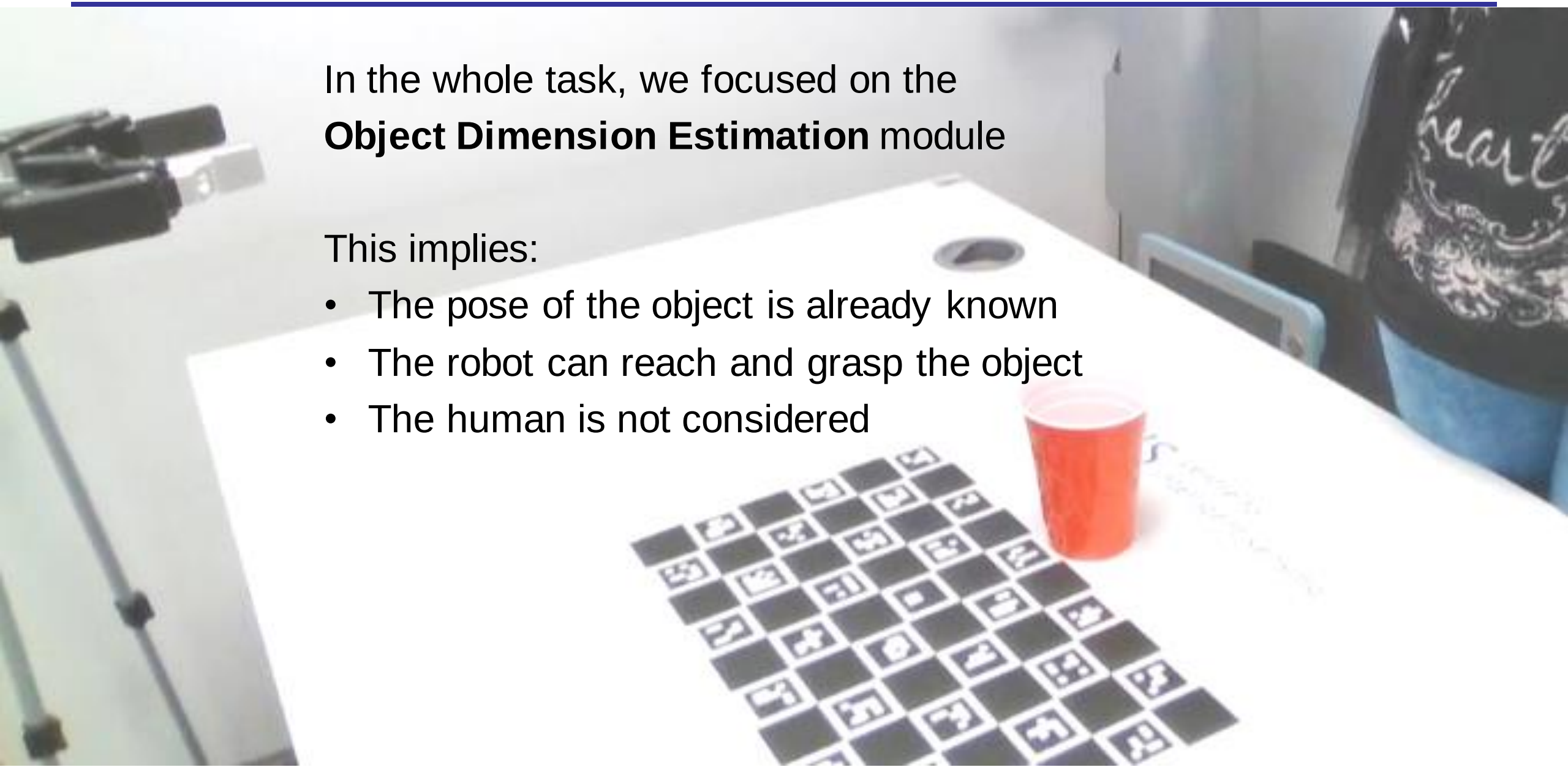
CORSMAL
Collaborative object recognition, shared manipulation and learning

Outline

- Introduction
- Challenges
- Implementation
- Results and conclusion

Introduction



In the whole task, we focused on the **Object Dimension Estimation** module

This implies:

- The pose of the object is already known
- The robot can reach and grasp the object
- The human is not considered

Challenges

Our first problem was to start from scratch.

First challenge: find a **suitable dataset** (multimodal)

2700 trials of visual+tactile shown in videos taken from two cameras (front and left)

Multimodal grasp data set: A novel visual–tactile data set for robotic manipulation
T Wang, C Yang, F Kirchner, P Du, F Sun, B Fang
International Journal of Advanced Robotic Systems 16 (1), 172988141882157 1

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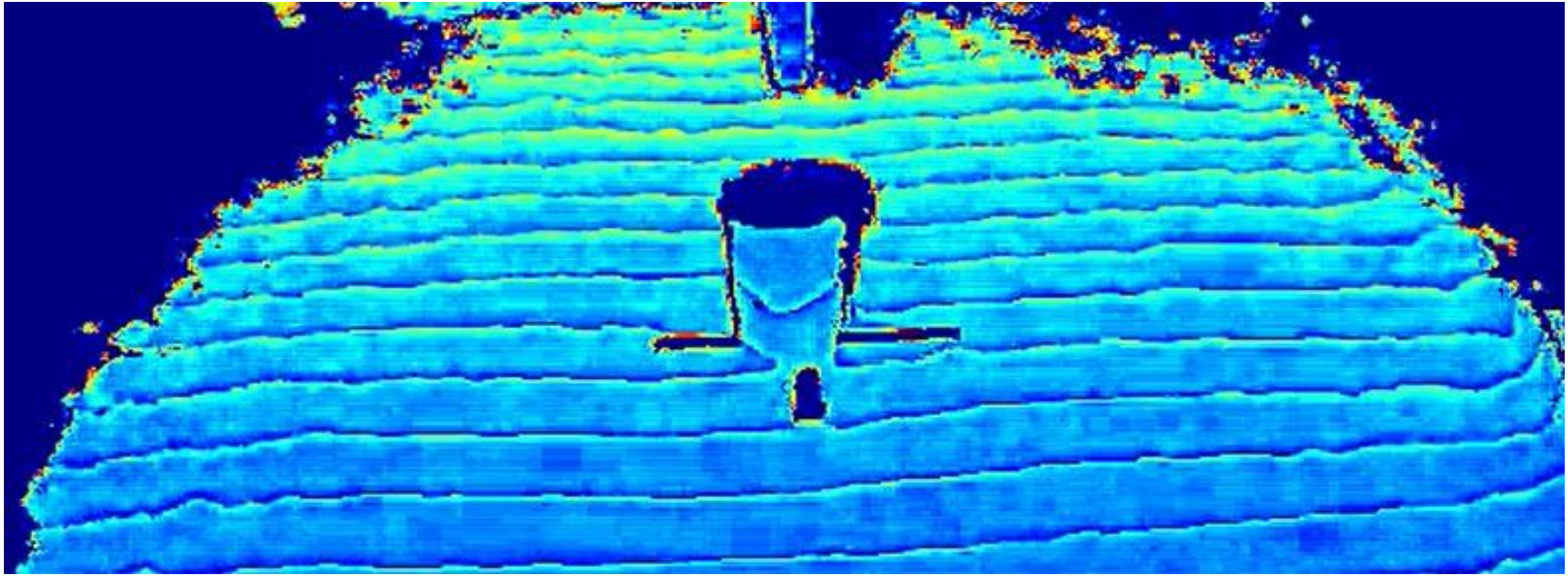
Challenges

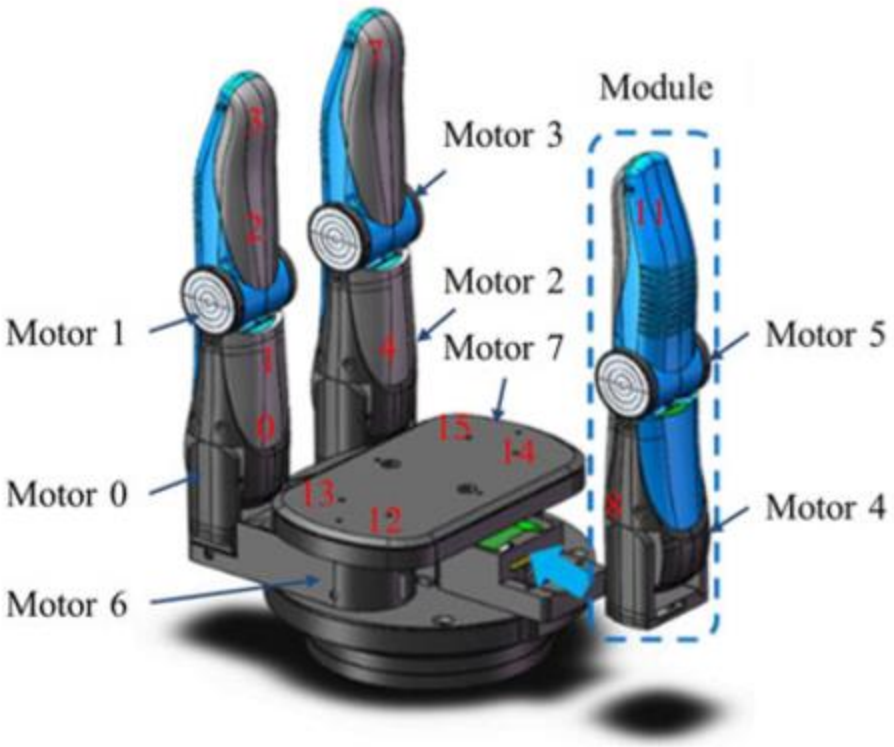
Given time constrains, the scope had to be simplified

Depth data was available but not used



Challenges

Joints data was available and easy to use, but was discarded as it might not correspond to the robot of our task



Challenges

An assumption was made regarding shapes:

Given that in the dataset there are only objects with approximately convex shapes,

We approximate them as a box or as a cylinder.

The outputs of the regression will be represented as:

Height x Width x Depth

Challenges

The output data of the regression task for our dataset was manually created

Pringles Original Crisps 190 g (Pack of 6)
by Pringles
1 customer review
Price: £17.62 (£1.55 / 100 g) FREE delivery.
6 new from £17.62
- Suitable for vegetarians and vegans
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Pot Noodl...
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Challenges

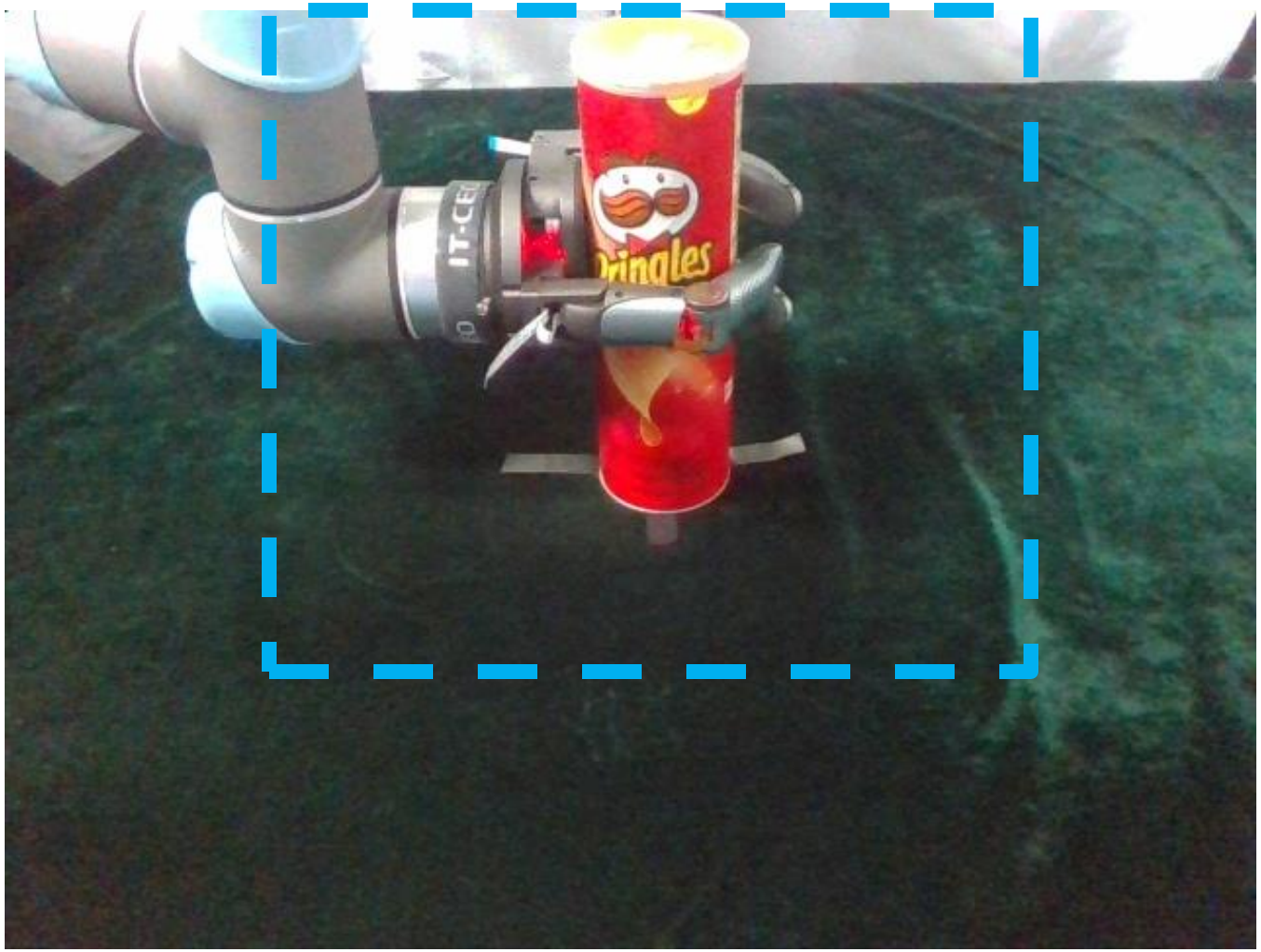
Tactile data was available but **not much relevant** in term of sensed forces.

Rather than using tactile data for the neural network, we **use the tactile data to determine the time** when the robot is touching the object, then use only the visual of that frame for the neural network.

Challenges

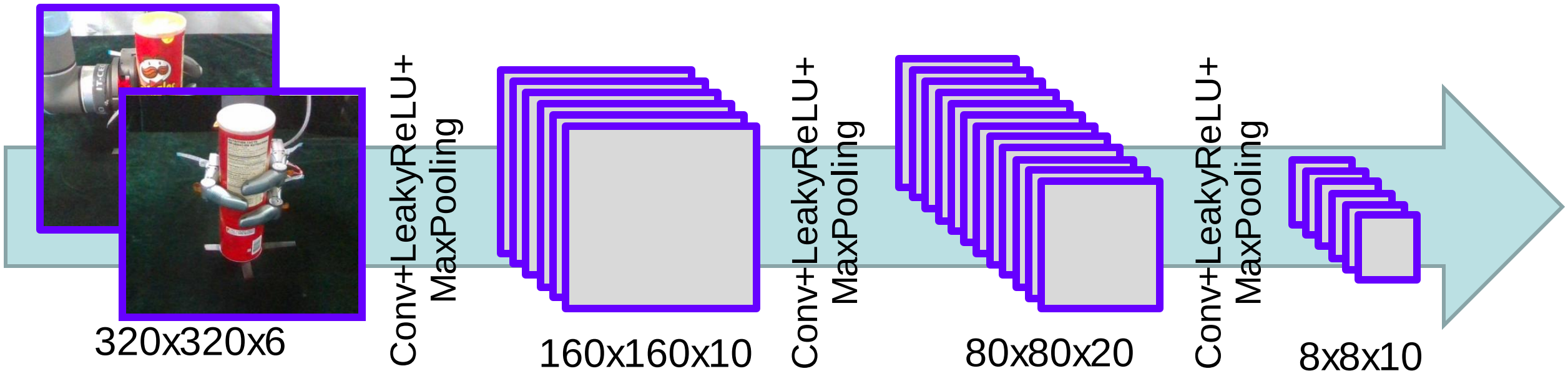
Input **images were cropped** to save on complexity of the learning problem and avoid unnecessary noise.

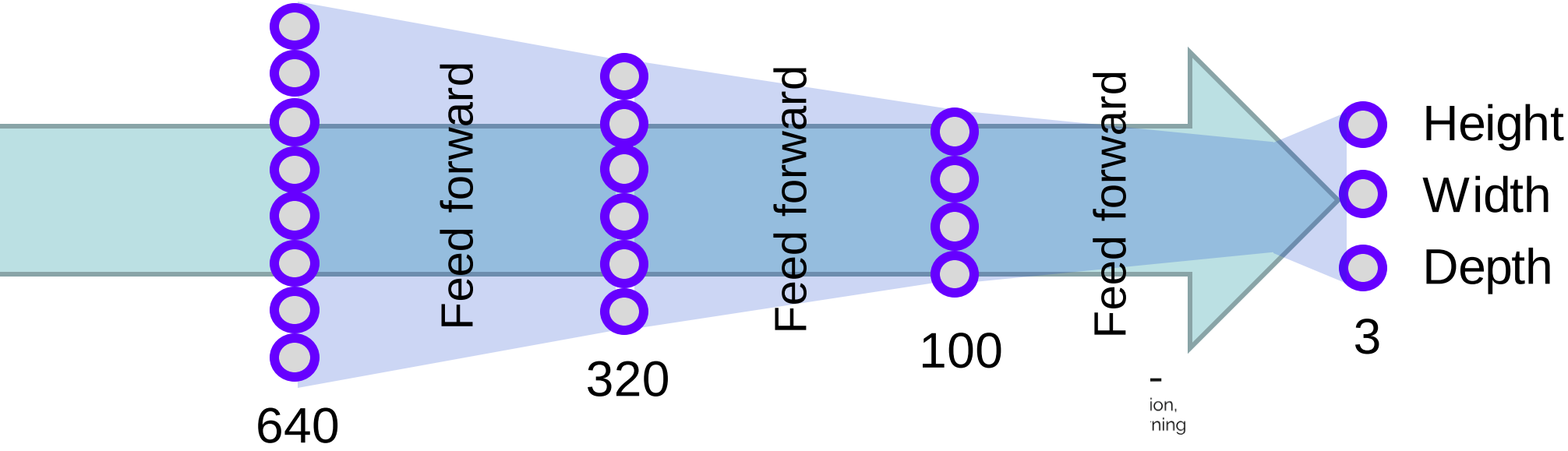
The images were made 320x320 pixels.



Implementation

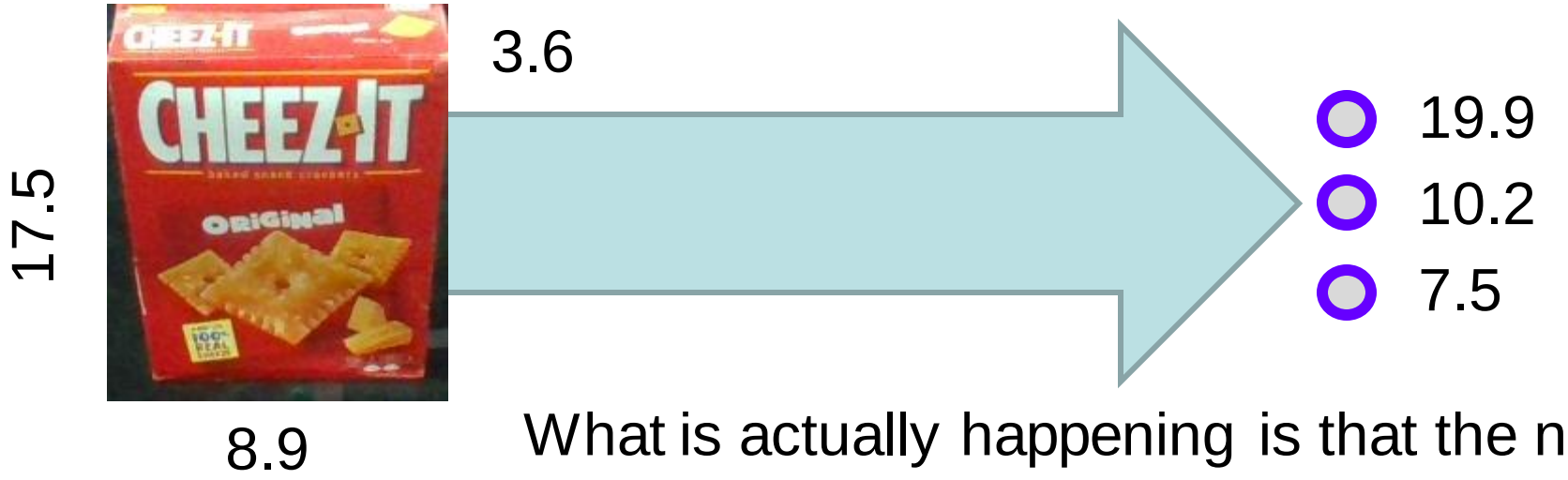
Implementation





Results

- Training with 50 epochs, 80% of the data for training and 20% for test took too many hours and had to be aborted.
- Trained with 10 epochs, with only 20% of the data for training and 20% for test: MSE Loss went down from more than 200 to aprroximately 15.



What is actually happening is that the network found a compromise estimate for **all the objects**, as they are all estimated to be around that size.

Conclusions

- **Achievements**
  - Regression task completed with 20%-30% error on the volume…
- **Limitations**
  - …but unable to distinguish significantly among the objects dimensions.
  - Can only estimate simple shapes. May have problems with dimensions differing from the grapsing point to the edges (such as a glass)
  - The placement of the cameras (front and left) is slightly different from the given task setup
- **Future work**
  - Revise network architecture and perform a better training
  - Re-add data about depth
  - Add data from robot joints
  - Implement on the robot