Machine Learning

Data for Verification

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Teaching, Training and Coaching for more than a decade!

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Thinking

- We want to brute-force all possible points locations (wrist, elbow)
- Compute the algorithm answer
- Compare and judge against some ground truth
- So the general direction, we need data (input, output) for most/all possible cases

Manual Data-Collection Approach

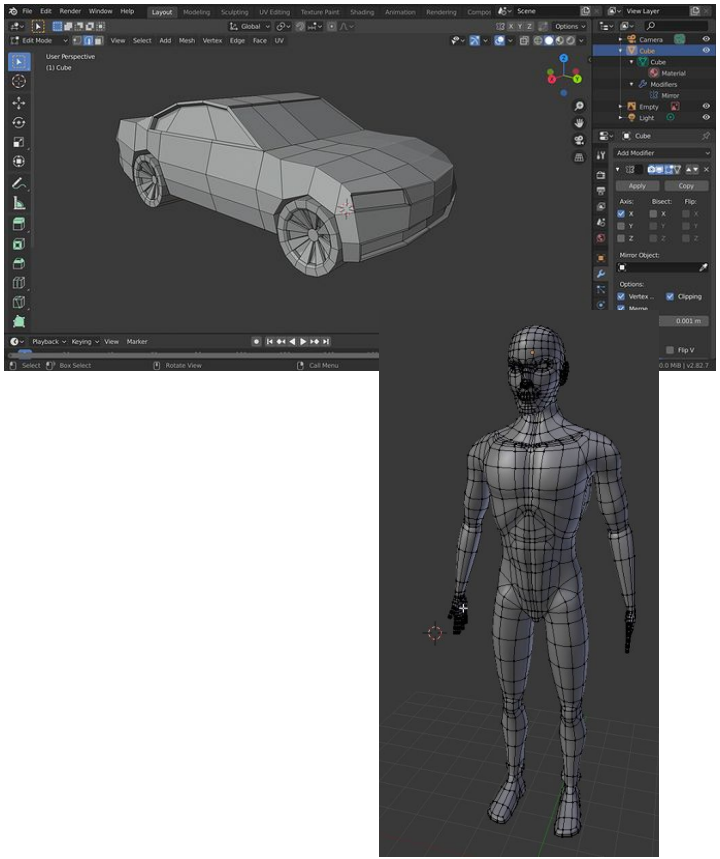
- Variables
  - We have 2 important factors
    - The size of the hand: small or big
    - The distance between the elbow and wrist
  - Probably we need around 3 persons where we see they have good variance
    - E.g. a woman with a small hand and small elbow-wrist distance
- Ask DC (data collection) team to collect videos for a person scanning the whole driver area with his hands in different positions
  - Divide the car to regions
  - User once scan the whole area slowly with the right hand then the left hand
  - For each scan: we can try 5 different hand poses that creates a different hand box
- Ask annotator team to annotate: the hand boxes and 2 joints

Speeding

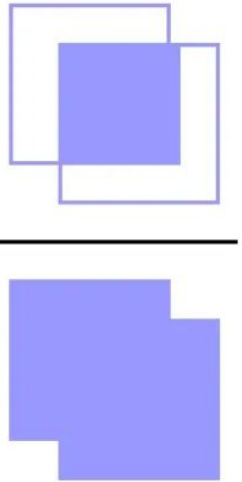
- If we asked the people to dress fully in white and used a glove of different color (e.g. red), we may be able to find automatically the hand
- Similar tricks might be done for the wrist and elbow
- But we may have inaccuracies.
- Given that the data is small, manual annotation is fair and enough

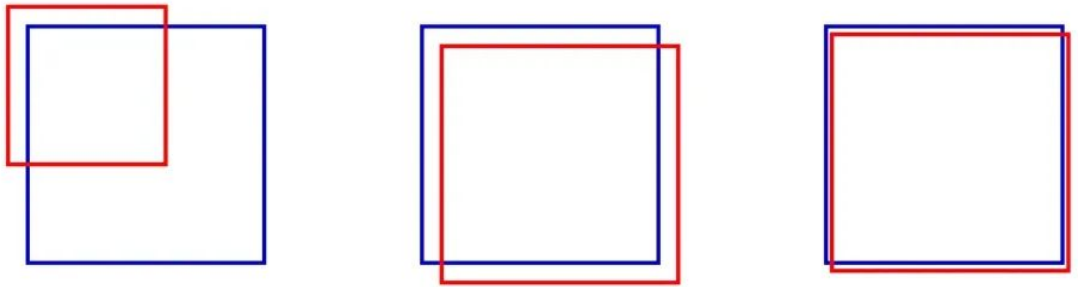
Utilizing 3D Graphics

- If we have 3D models for car and human, we might be able to simulate all the different positions (and vary the human sizes). Then project on 2D space
- This way we have all the data and annotations
- However, developing these graphics takes time



$$IoU = \frac{\text{Area of Overlap}}{\text{Area of Union}}$$





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Intersection over Union (IoU)

- Intersection over Union (IoU) is a metric commonly used to quantify the overlap between two bounding boxes or shapes.
- The idea is to compare the area of overlap between the ground-truth and predicted bounding boxes to the area encompassed by the union of the two boxes.
- The IoU metric ranges from 0 to 1, where 0 indicates no overlap and 1 indicates a perfect match. A higher IoU score usually signifies better performance of an object detection model.
- A typical threshold is > 0.75
- Coding IoU is a common coding task for computer vision engineers

"Acquire knowledge and impart it to the people."

"Seek knowledge from the Cradle to the Grave."