

Yaskawa Group 2 Design Proposal: Scanning and Orienting Test tubes

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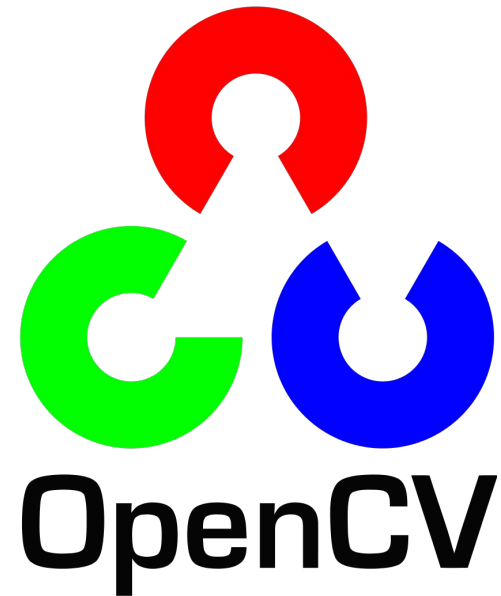


YASKAWA

Design Proposal

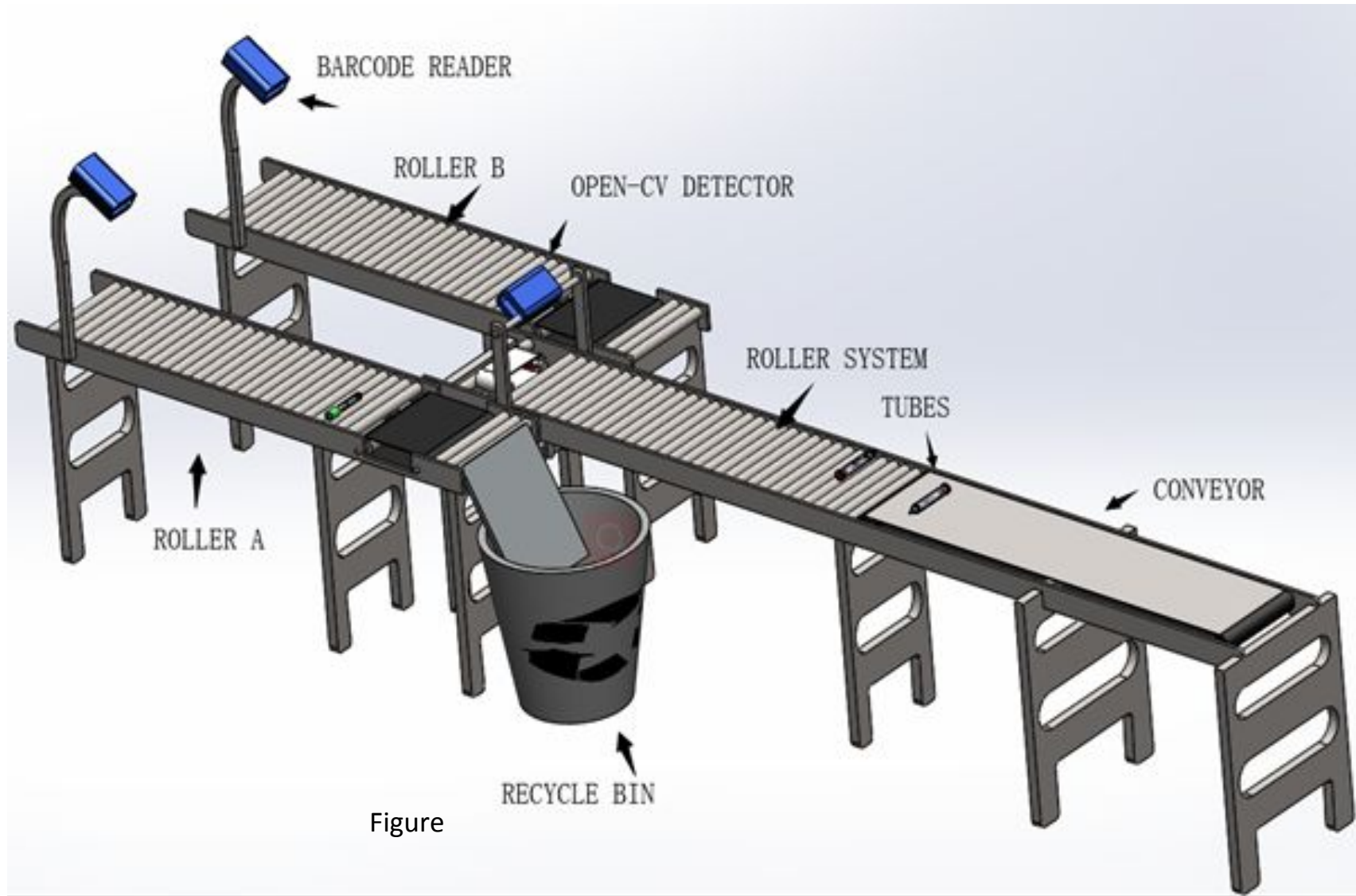


Identifying Test tube Cap

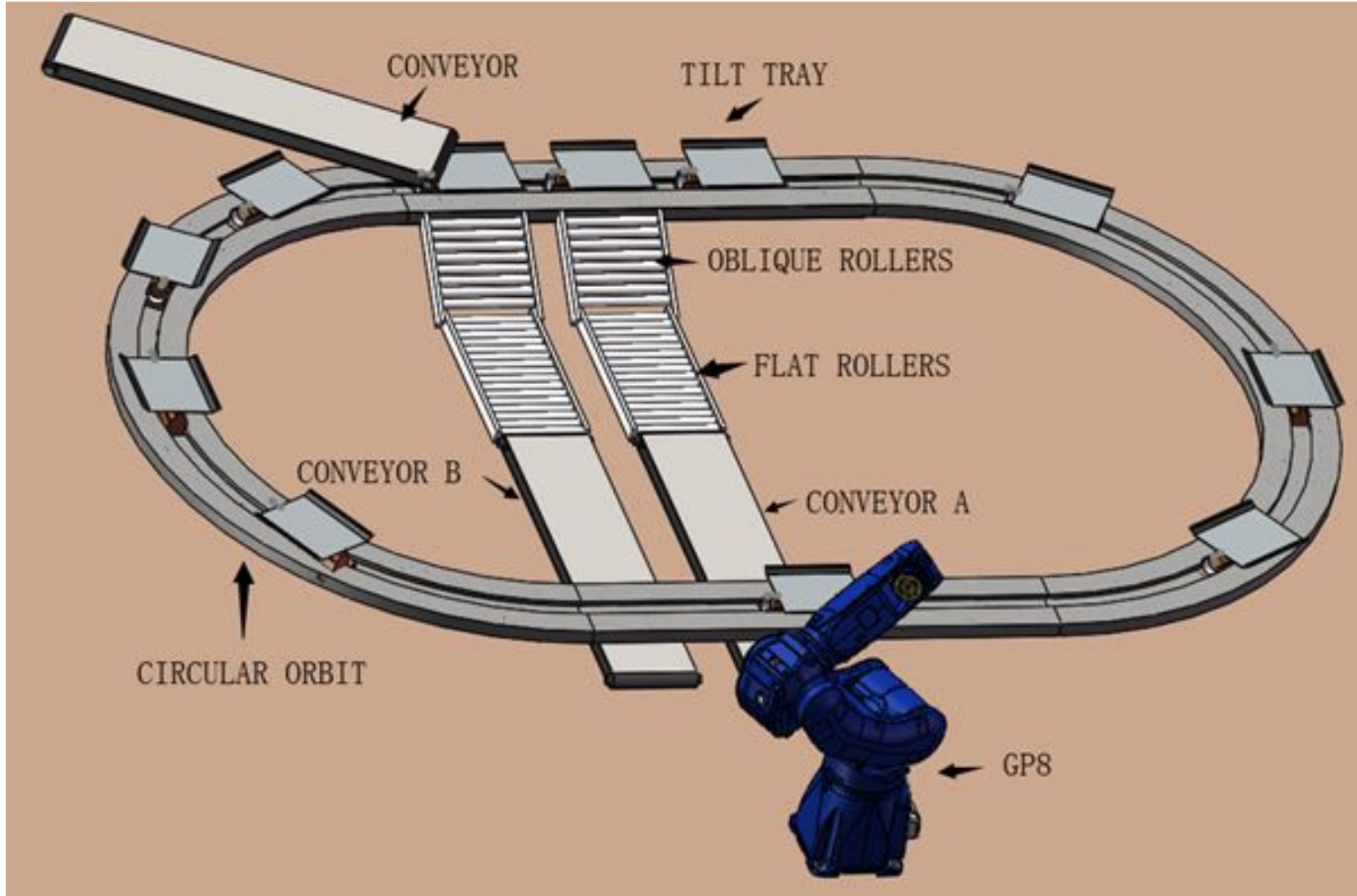


Evaluation





Figure



Identifying Cap

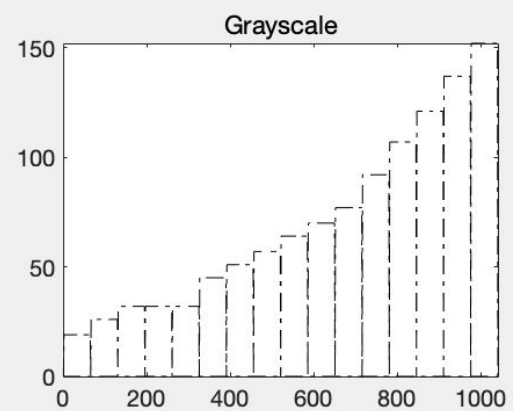
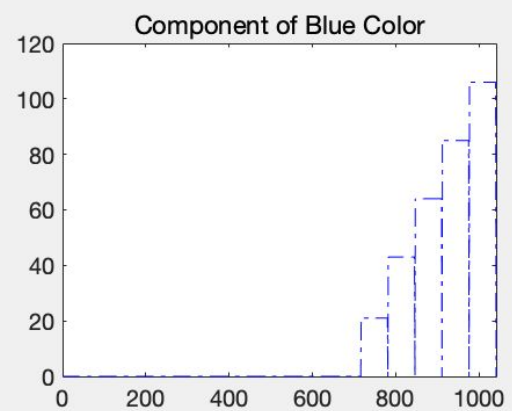
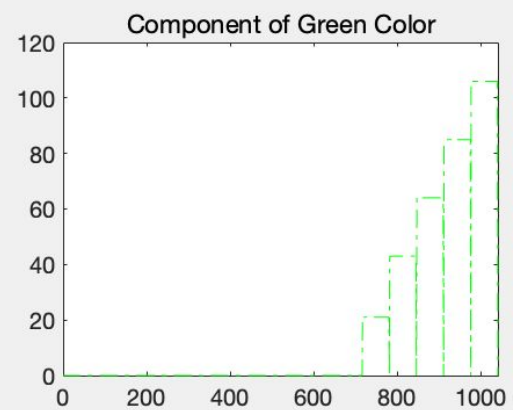
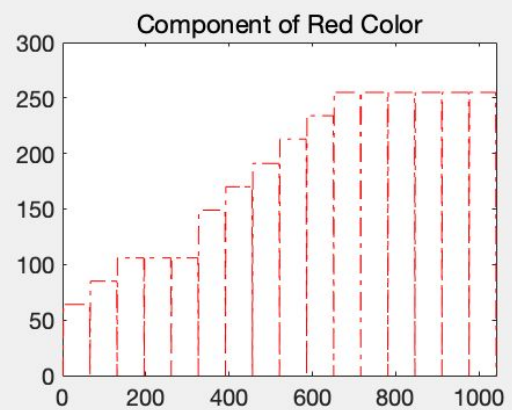
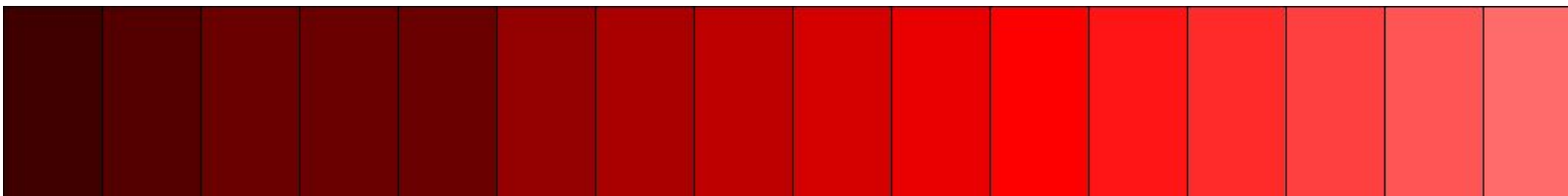
Identify Cap

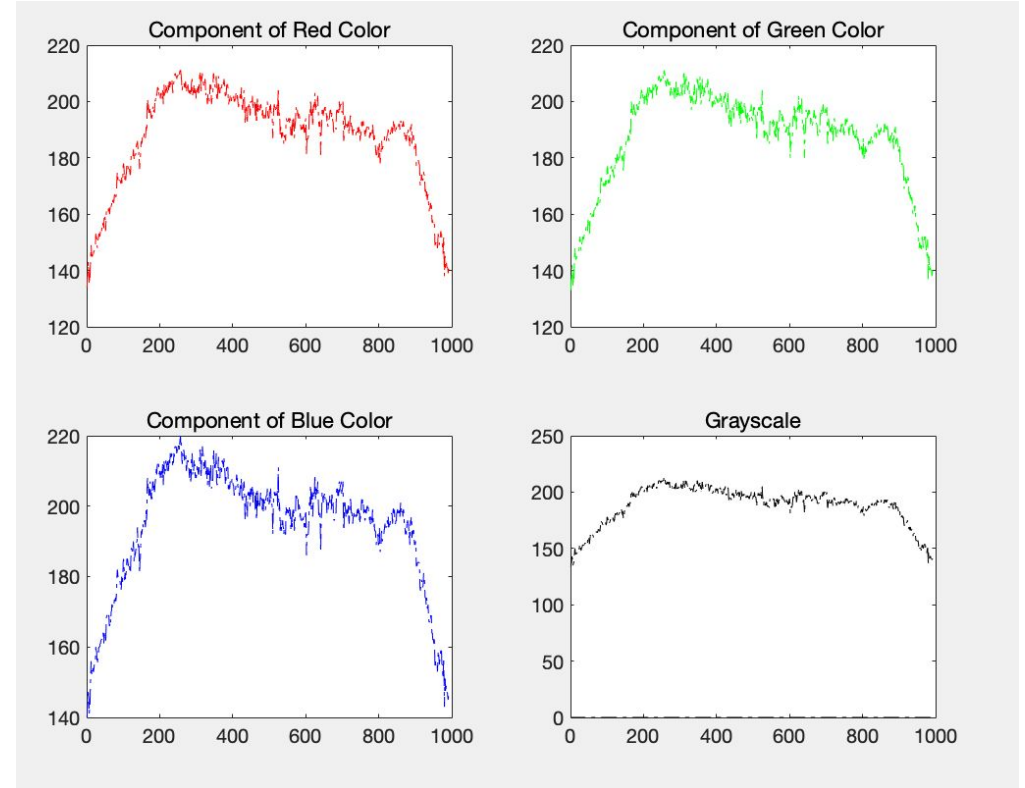
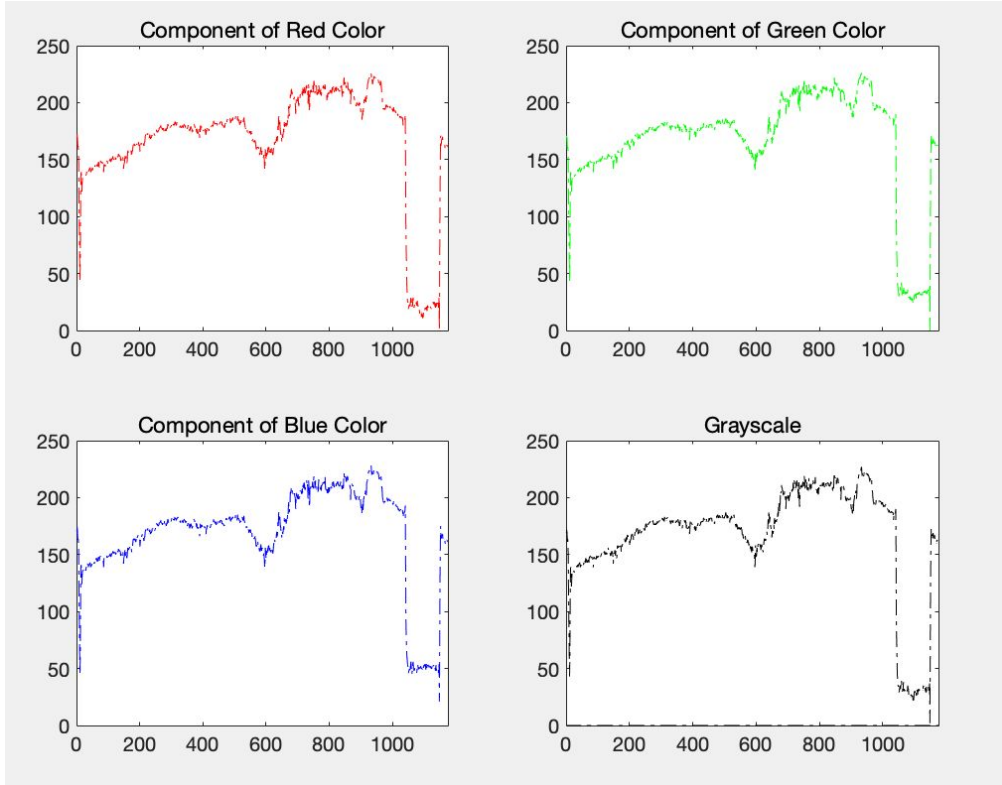
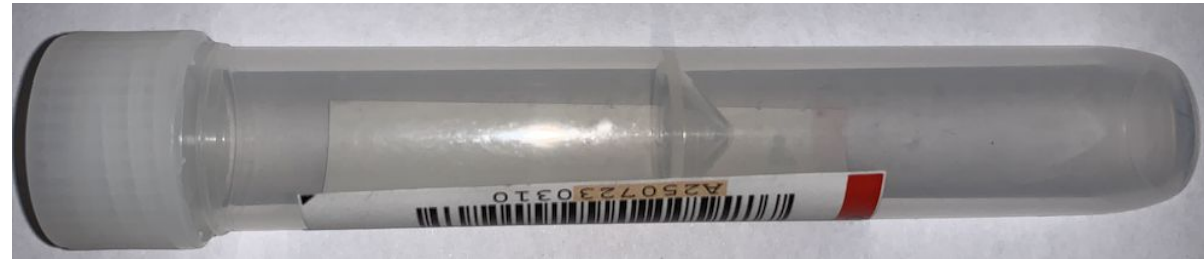


First method: color detection

RGB component:

Gray-scale value: the brighter the color, the bigger the value

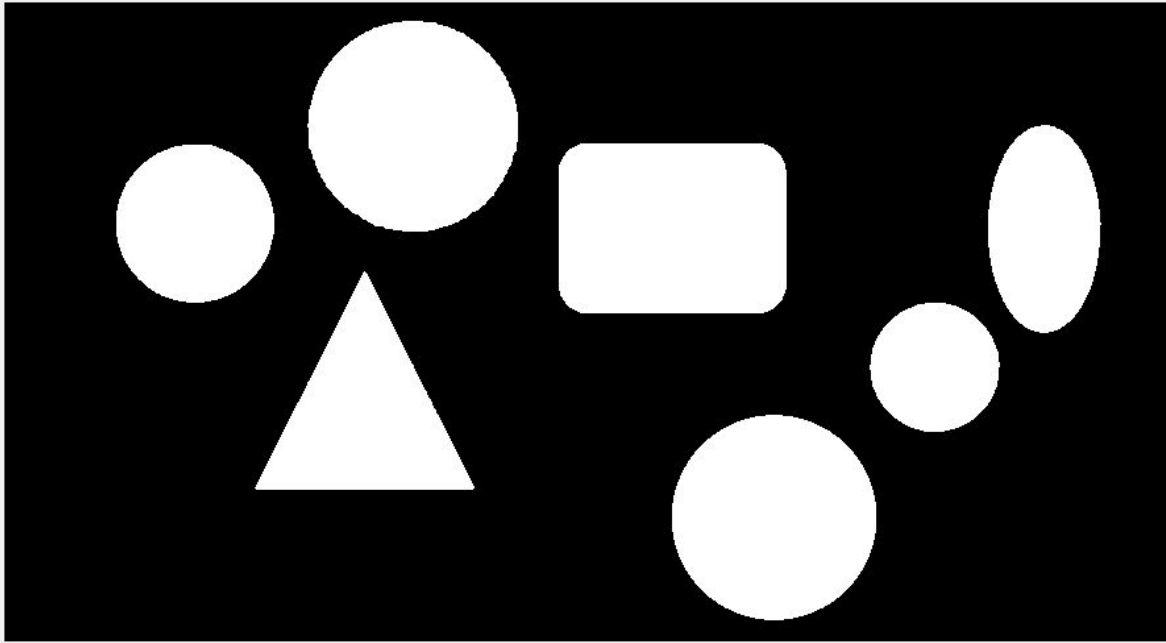




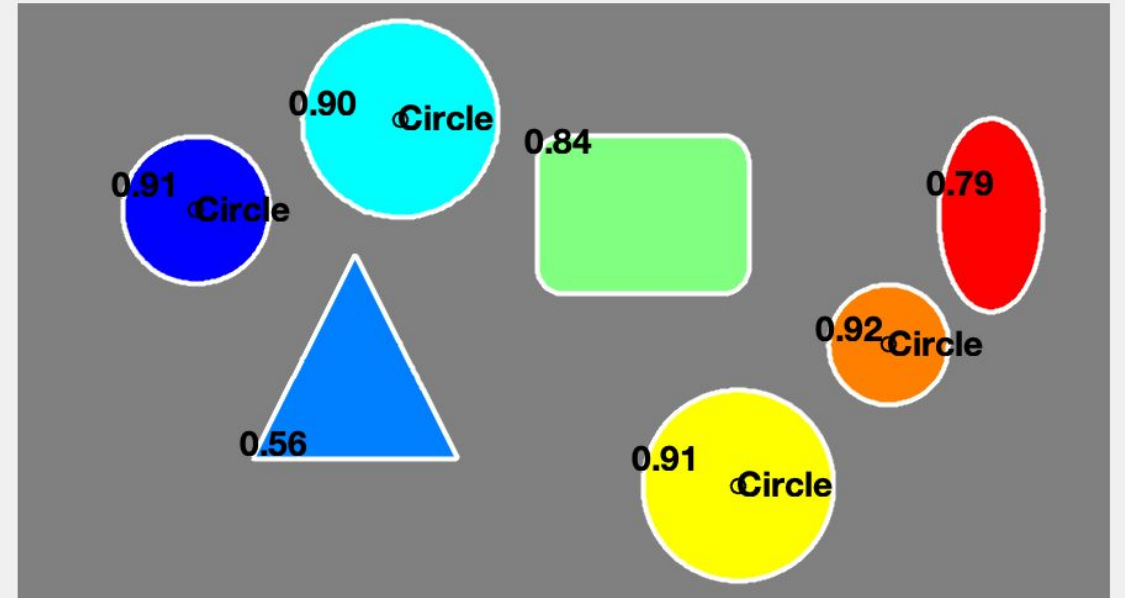
Second method: Shape recognition



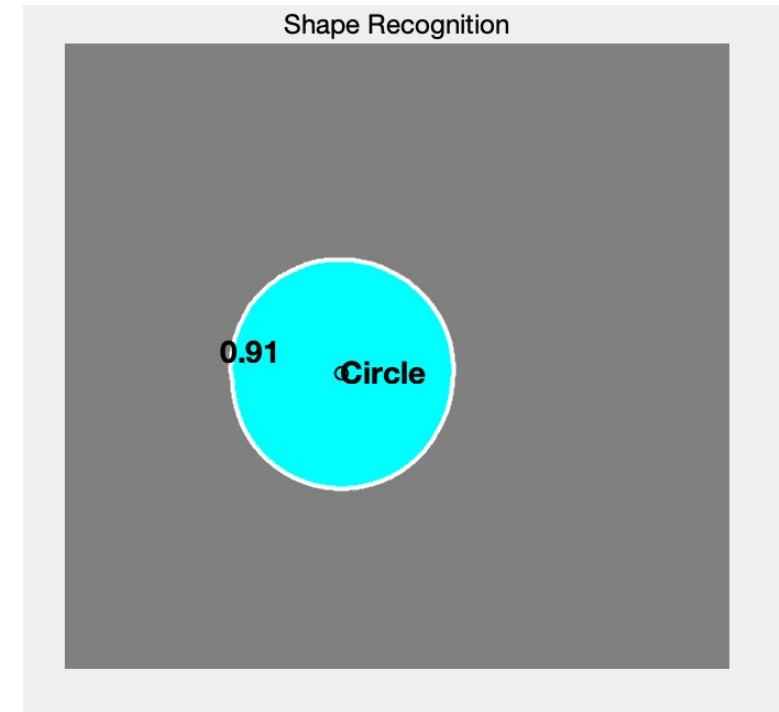
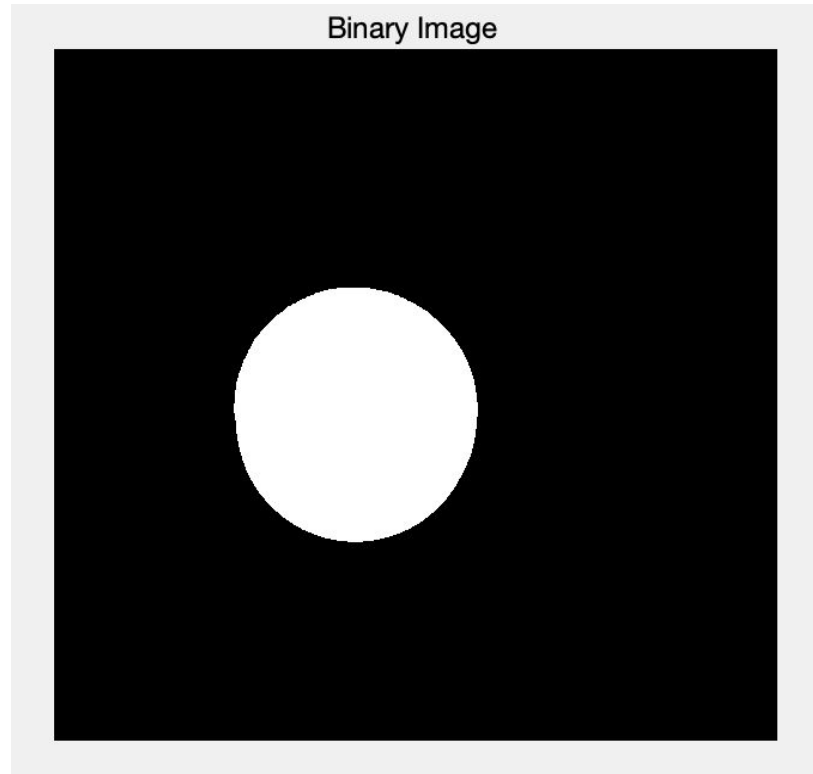
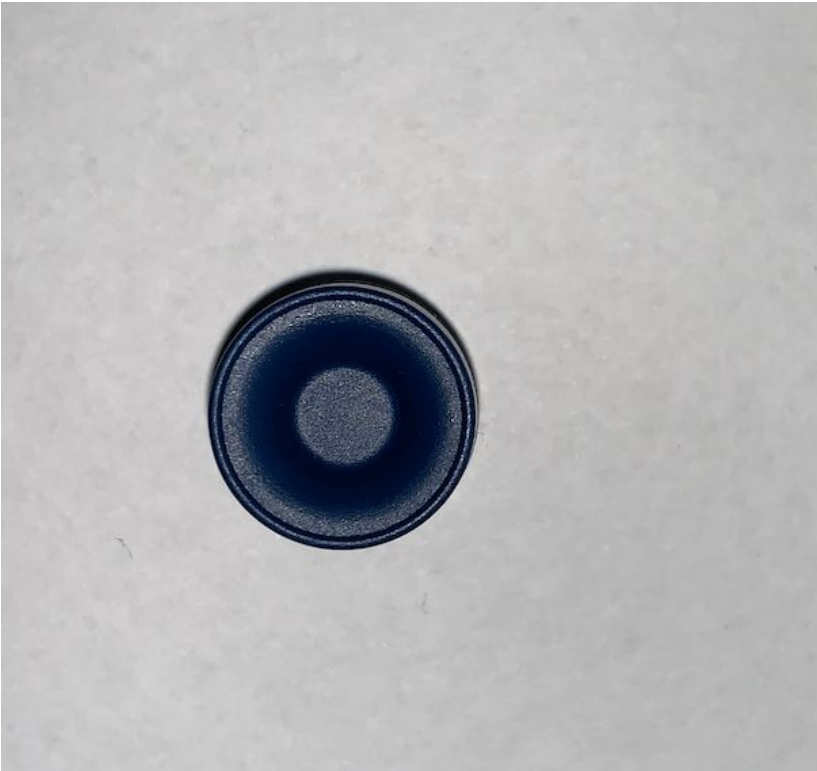
Binary Image



Shape Recognition



cap



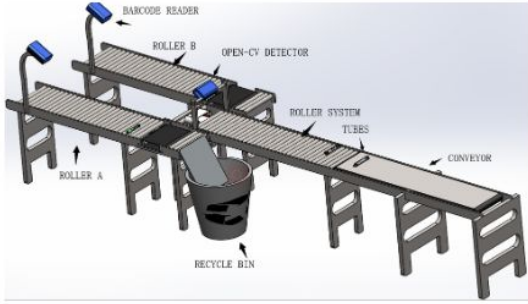
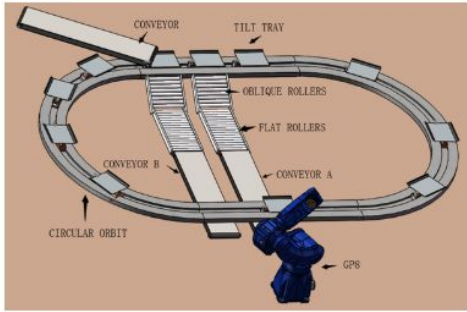
By comparing the size, we can identify the cap

Evaluating our Design Proposals

Table 1. AHP Matrix for Project Needs

| | Speed Rate | Cost | Reliability | Precision/ Accuracy | Safety (test tube) | Workspace | User-friendly | Total | Weighting |
|------------------------|------------|------|-------------|------------------------|-----------------------|-----------|---------------|-------|-----------|
| Speed Rate | 1 | 2 | 1/2 | 1/3 | 1/4 | 1 | 2 | 7.08 | 0.1 |
| Cost | 1/2 | 1 | 1/2 | 1/4 | 1/5 | 1/2 | 1/3 | 3.28 | 0.05 |
| Reliability | 2 | 2 | 1 | 2 | 1/3 | 2 | 1 | 10.33 | 0.15 |
| Precision/ Accuracy | 4 | 4 | 1/2 | 1 | 1/3 | 2 | 1 | 12.83 | 0.18 |
| Safety (Test tubes) | 4 | 5 | 3 | 3 | 1 | 4 | 3 | 23 | 0.32 |
| Workspace | 1 | 2 | 1/2 | 1/2 | 1/4 | 1 | 1/2 | 5.75 | 0.08 |
| User-friendly | 1/2 | 3 | 1 | 1 | 1/3 | 2 | 1 | 8.83 | 0.12 |
| | | | | | | | Total | 71.12 | |

Table. 4 Concept Scoring the Two Design Proposals

| | | Design A | | Design B | |
|---------------------|------------|--|----------------|---|----------------|
| | |  | |  | |
| Selection Criteria | AHP Weight | Score | Weighted Score | Score | Weighted Score |
| Speed Rate | 0.10 | 3 | 0.3 | 4 | 0.4 |
| Cost | 0.05 | 5 | 0.25 | 2 | 0.1 |
| Reliability | 0.15 | 4 | 0.6 | 3 | 0.45 |
| Position / Accuracy | 0.18 | 3 | 0.54 | 4 | 0.72 |
| Safety (Test tubes) | 0.32 | 3 | 0.96 | 4 | 1.28 |
| Workspace | 0.08 | 4 | 0.32 | 1 | 0.08 |
| User-friendly | 0.12 | 5 | 0.6 | 3 | 0.36 |
| | | Sum | 3.57 | Sum | 3.39 |

