WORKSHEET

4.1 What the camera sees

BugBotLab

Vision · Robot club · about 15 min

Name _____ Class _____ Date _____

What this lesson is about

set_cv, the tag list, pixels and distance, empty lists.

- One detector at a time
- The list
- Watch the distance fall
- When there is nothing to see

Questions

7 marks in all

1. A program calls `apriltags()` before it has called `set_cv`. What does it get? [1 mark]

- ☐ **A** An empty list, because no detector is switched on
- ☐ **B** Every tag the camera can see
- ☐ **C** An error saying the camera is off
- ☐ **D** The tags from the last program that ran

2. Each entry in `apriltags()` is `[id, cx, cy, distance]`. What is `tag[3]`? [1 mark]

- ☐ **A** How far away the tag is, in cm
- ☐ **B** The number printed on the tag
- ☐ **C** How far across the picture it is, in pixels
- ☐ **D** How far down the picture it is, in pixels

3. The picture is 320 pixels wide. What `cx` does a tag straight ahead of the robot have? [1 mark]

4. What does this program print? [1 mark]

```
tag = [7, 160, 120, 45.0]
print(f"marker {tag[0]} at {tag[3]} cm")
```

5. The robot turns away so no tag is in view, then runs `tag = apriltags()[0]`. What happens? [1 mark]

- ☐ **A** An error, because there is no first item in an empty list
- ☐ **B** `tag` becomes 0
- ☐ **C** `tag` becomes an empty list
- ☐ **D** It waits until a tag comes into view

6. Which of these are true of the list `apriltags()` gives you? [1 mark]

Tick every answer that is true.

- ☐ **A** The nearest tag comes first
- ☐ **B** There is one entry for each tag it can read
- ☐ **C** `cx` is measured in cm
- ☐ **D** An empty list means something has gone wrong

7. Marker 7 is 45 cm away. The robot drives forward 8 cm towards it. About what distance, in cm, should the next `apriltags()` report? [1 mark]

The task: find the marker

Switch on the tag detector and print `marker 7 at 45.0 cm` using the id and distance from the list. Do not drive.

```
# the two lines every program starts with: the commands, then the robot
from bugbot import *
connect()

print(apriltags())
```

Plan your program here, then type it in and press Run.

Do it on the robot

www.bugbotlab.com/learn/4-1-what-the-camera-sees/

The simulator checks it and tells you when it passes. Nothing to install, no account.

Challenges

1. Print `cx` and `cy` as well, in the form `marker 7 at 45.0 cm, pixel (160, 120)`.
2. Drive forward 5 cm at a time and print the distance until it is under 20.
3. Keep driving in 1 cm at a time. How close can the robot get and still read the tag? What happens to `cx` on the way in, and why?