How to use ArUco markers for visual navigation

Scenario example:

User performing indoor navigation application.

For functionality similar to the above scenario, you can refer to the following project: pepper-aruco

Project description:

This project mainly helps users:

- Find and detect Aruco markers via Pepper
- Allow users to locate and navigate using the markers as signs.

You can refer to the following steps to integrate this feature into your project.

Step 1: Add the Jitpack library

Add it at the end of the repository in the build.gradle file:

```
allprojects {
repositories {
...
maven { url ‘https://jitpack.io’ }
}
}
```

Step 2: Add the pepper-aruco dependency

```
dependencies {
implementation ‘com.github.softbankrobotics-labs:pepper-aruco:master-SNAPSHOT’
}
```

Step 3: Add the OpenCV library

Add all .so files in the aruco-navigation-root/app/src/main/jniLibs directory to your project.

Step 4: Load OpenCV

In activity, you need to load OpenCV library in onCreate() method:

```
public MyActivity extends AppCompatActivity implements RobotLifecycleCallbacks {

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);

        OpenCVUtils.loadOpenCV(this);
    }

}
```

Step 5: Find the QR Code

Have Pepper look around for the ArUco QR code, the rule is to turn 30 degrees to the left, then look forward, then turn 30 degrees to the right again. The qiContext.arucoDetection.lookAroudnForMarker method is required.

```
DetectArucoConfig detectConfig = new DetectArucoConfig(0.0D, (ArucoDictionary)null, (HashMap)null,

detectConfig.setMarkerLength((double)ARUCO_MARKER_SIZE / 100.0D);
detectConfig.setDictionary(ArucoDictionary.DICT_4X4_50);
LookAroundConfig lookAroundConfig = new LookAroundConfig((LookAtMovementPolicy)null,(List)null,3,(D
lookAroundConfig.setLookAtPolicy(LookAtMovementPolicy.HEAD_AND_BASE);
double phi = 90.0D;
double[] thetas = new double[]{-90.0D, -60.0D, -30.0D, 0.0D, 30.0D, 60.0D, 90.0D};

Future lookAroundFuture = ArucoDetectionKt.getArucoDetection(qiContext).lookAroundForMarker(lookAro
```

Step 6: Detect the QR code

Use Pepper's head camera to detect the QR code using the qiContext.arucoDetection.detectMarkerWithTopCamera method.

```
DetectArucoConfig config = new DetectArucoConfig(0.0D, (ArucoDictionary)null, (HashMap)null, (doubl

config.setMarkerLength((double)ARUCO_MARKER_SIZE / 100.0D);
config.setDictionary(ArucoDictionary.DICT_4X4_50);
Future f = ArucoDetectionKt.getArucoDetection(qiContext).detectMarkerWithTopCamera(config);
```

Step 7: Adding and removing listeners

Listeners can be added whenever they are detected or re-detected:

```
ArucoDetectionKt.getArucoDetection(qiContext).addOnArucoMarkerDetectedListener((OnArucoMarkerDetect
         public void onArucoMarkerDetected(@NotNull final ArucoMarker arucoMarker, @NotNull final A

     }
}));
```