

Config4

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Chapter 1

Namespace Index

1.1 Namespace List

Here is a list of all namespaces with brief descriptions:

camera_capture	9
object_detection_c4	10
object_detection_v1	11

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Node	
camera_capture.CameraCapture	17
object_detection_c4.ObjectDetection	19

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

camera_capture.CameraCapture	
A class to capture frames from a camera and publish them as ROS messages	17
object_detection_c4.ObjectDetection	
A class to detect objects in an image and publish their locations as ROS messages	19

Chapter 4

File Index

4.1 File List

Here is a list of all files with brief descriptions:

camera_capture.py	23
object_detection_c4.py	23
object_detection_v1.py	24

Chapter 5

Namespace Documentation

5.1 camera_capture Namespace Reference

Classes

- class [CameraCapture](#)
A class to capture frames from a camera and publish them as ROS messages.

Functions

- def [main](#) (args=None)
Main function which initializes the ROS client library, creates a [CameraCapture](#) node, and spins.

Variables

- Users [C](#) :\\Users\\sin_p\\OneDrive - USN\\Dokumenter\\Bachelor\\Doxygen\\Dokumentasjon\\Doxygen\\↔
Config4>doxypy -a -c "C:/Users/sin_p/OneDrive - USN/Dokumenter/Bachelor/Doxygen/Dokumentasjon/Doxygen/Config4/ca
_capture.py"

5.1.1 Function Documentation

5.1.1.1 main()

```
def camera_capture.main (
    args = None )
```

Main function which initializes the ROS client library, creates a [CameraCapture](#) node, and spins.

Parameters

<i>args</i>	Arguments passed to rclpy.init. Defaults to None.
-------------	---

5.1.2 Variable Documentation

5.1.2.1 C

```
Users camera_capture.C : \Users\sin_p\OneDrive - USN\Dokumenter\Bachelor\Doxygen\Dokumentasjon\↔
Doxygen\Config4>doxypy -a -c "C:/Users/sin_p/OneDrive - USN/Dokumenter/Bachelor/Doxygen/Dokumentasjon/Doxyg
_capture.py"
```

5.2 object_detection_c4 Namespace Reference

Classes

- class [ObjectDetection](#)

A class to detect objects in an image and publish their locations as ROS messages.

Functions

- def [main](#) (args=None)

Main function which initializes the ROS client library, creates an [ObjectDetection](#) node, and spins.

Variables

- Users [C](#) : \Users\sin_p\OneDrive - USN\Dokumenter\Bachelor\Doxygen\Dokumentasjon\Doxygen\↔
Config4>doxypy -a -c "C:/Users/sin_p/OneDrive - USN/Dokumenter/Bachelor/Doxygen/Dokumentasjon/Doxygen/Config4/ob
_detection_c4.py"

5.2.1 Function Documentation

5.2.1.1 main()

```
def object_detection_c4.main (
    args = None )
```

Main function which initializes the ROS client library, creates an [ObjectDetection](#) node, and spins.

Parameters

<i>args</i>	Arguments passed to rclpy.init. Defaults to None.
-------------	---

5.2.2 Variable Documentation

5.2.2.1 C

```
Users object_detection_c4.C : \Users\sin_p\OneDrive - USN\Dokumenter\Bachelor\Doxygen\Dokumentasjon\↔
Doxygen\Config4>doxypy -a -c "C:/Users/sin_p/OneDrive - USN/Dokumenter/Bachelor/Doxygen/Dokumentasjon/Doxyg
_detection_c4.py"
```

5.3 object_detection_v1 Namespace Reference

Functions

- def `calculateDistance` (`ballRadius_px`)
Calculate the distance from the camera to the object based on its radius in pixels.
- def `detect_colored_object` (`colorLower`, `colorUpper`, `min_radius`, `max_radius`)
Detect a colored object within a given color range and size.
- def `display_object_info` (`frame`, `x`, `y`, `radius`, `distance`, `color`, `text_offset`)
Display information about the detected object on the frame.

Variables

- Users `C` : \Users\sin_p\OneDrive - USN\Dokumenter\Bachelor\Doxygen\Dokumentasjon\Doxygen\↔
Config4>doxypy -a -c "C:/Users/sin_p/OneDrive - USN/Dokumenter/Bachelor/Doxygen/Dokumentasjon/Doxygen/Config4/ob
_detection_v1.py"
- float `ballRadius` = 3.25
- float `cameraFOV` = 62.2
- tuple `faktor` = (1280 / 2) * (`ballRadius` / math.tan(math.radians(`cameraFOV` / 2)))
- dict `colors`
- FPS `fpsreader` = FPS()
- cv `videoCap` = cv.VideoCapture(0)
- `grabbed`
- `frame` = imutils.resize(`frame`, width=1280)
- `fps`
- `img`
- `color`
- cv `hsv` = cv.cvtColor(`frame`, cv.COLOR_BGR2HSV)
- def `obj`
- `x`
- `y`
- `ballRadius_px`
- def `distance` = `calculateDistance`(`ballRadius_px`)
- cv `key` = cv.waitKey(1)

5.3.1 Function Documentation

5.3.1.1 `calculateDistance()`

```
def object_detection_v1.calculateDistance (
    ballRadius_px )
```

Calculate the distance from the camera to the object based on its radius in pixels.

Parameters

<i>ballRadius_px</i>	The radius of the ball in pixels.
----------------------	-----------------------------------

Returns

The calculated distance in cm.

5.3.1.2 detect_colored_object()

```
def object_detection_v1.detect_colored_object (
    colorLower,
    colorUpper,
    min_radius,
    max_radius )
```

Detect a colored object within a given color range and size.

Parameters

<i>colorLower</i>	The lower boundary of the color range in HSV format.
<i>colorUpper</i>	The upper boundary of the color range in HSV format.
<i>min_radius</i>	The minimum radius of the object to detect.
<i>max_radius</i>	The maximum radius of the object to detect.

Returns

The (x, y) coordinates and radius of the detected object, or None if no object is detected.

5.3.1.3 display_object_info()

```
def object_detection_v1.display_object_info (
    frame,
    x,
    y,
    radius,
    distance,
    color,
    text_offset )
```

Display information about the detected object on the frame.

Parameters

<i>frame</i>	The frame on which to display the information.
<i>x</i>	The x-coordinate of the object.

Parameters

<i>y</i>	The y-coordinate of the object.
<i>radius</i>	The radius of the object.
<i>distance</i>	The distance to the object.
<i>color</i>	The color of the circle to be drawn around the object.
<i>text_offset</i>	The offset of the distance text under the FPS indicator.

5.3.2 Variable Documentation

5.3.2.1 ballRadius

```
float object_detection_v1.ballRadius = 3.25
```

5.3.2.2 ballRadius_px

```
object_detection_v1.ballRadius_px
```

5.3.2.3 C

```
Users object_detection_v1.C : \Users\sin_p\OneDrive - USN\Dokumenter\Bachelor\Doxygen\Dokumentasjon\↵  
Doxygen\Config4>doxypypy -a -c "C:/Users/sin_p/OneDrive - USN/Dokumenter/Bachelor/Doxygen/Dokumentasjon/Doxyg  
_detection_v1.py"
```

5.3.2.4 cameraFOV

```
float object_detection_v1.cameraFOV = 62.2
```

5.3.2.5 color

```
object_detection_v1.color
```

5.3.2.6 colors

```
dict object_detection_v1.colors
```

Initial value:

```
00001 = {
00002     'green': { # "GRØNN" in Norwegian
00003         'lower': (72, 70, 32), #(L-H, L-S, L-V)
00004         'upper': (99, 244, 107), #(U-H, U-S, U-V)
00005         'min_radius': 0, # ex between 20
00006         'max_radius': 0, # to 60 pixels
00007         'color': (0, 255, 0), # Color of the circle around object
00008         'text_offset': 0, # Distance text position under FPS
00009     },
00010     'orange': {
00011         'lower': (0, 115, 99), #(L-H, L-S, L-V)
00012         'upper': (18, 255, 255), #(U-H, U-S, U-V)
00013         'min_radius': 0,
00014         'max_radius': 0,
00015         'color': (0, 102, 255), # Color of the circle around object
00016         'text_offset': 20, # Distance text position under FPS
00017     },
00018     'red': { # "VINRØD" in Norwegian, which means deep red or wine red
00019         'lower': (119, 37, 0), #(L-H, L-S, L-V)
00020         'upper': (179, 179, 147), #(U-H, U-S, U-V)
00021         'min_radius': 0,
00022         'max_radius': 0,
00023         'color': (0, 0, 255), # Color of the circle around object
00024         'text_offset': 40, # Distance text position under FPS
00025     },
00026 }
```

5.3.2.7 distance

```
def object_detection_v1.distance = calculateDistance(ballRadius_px)
```

5.3.2.8 faktor

```
tuple object_detection_v1.faktor = (1280 / 2) * (ballRadius / math.tan(math.radians(cameraFOV / 2)))
```

5.3.2.9 fps

```
object_detection_v1.fps
```

5.3.2.10 fpsreader

```
FPS object_detection_v1.fpsreader = FPS()
```

5.3.2.11 frame

```
imutils object_detection_v1.frame = imutils.resize(frame, width=1280)
```

5.3.2.12 grabbed

```
object_detection_v1.grabbed
```

5.3.2.13 hsv

```
cv object_detection_v1.hsv = cv.cvtColor(frame, cv.COLOR_BGR2HSV)
```

5.3.2.14 img

```
object_detection_v1.img
```

5.3.2.15 key

```
cv object_detection_v1.key = cv.waitKey(1)
```

5.3.2.16 obj

```
def object_detection_v1.obj
```

Initial value:

```
00001 = detect_colored_object(color_info['lower'], color_info['upper'], color_info['min_radius'],
00002                               color_info['max_radius'])
```

5.3.2.17 videoCap

```
cv object_detection_v1.videoCap = cv.VideoCapture(0)
```

5.3.2.18 x

```
object_detection_v1.x
```

5.3.2.19 y

```
object_detection_v1.y
```

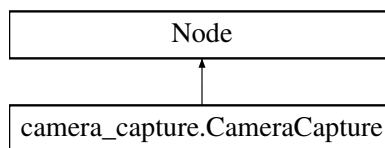

Chapter 6

Class Documentation

6.1 camera_capture.CameraCapture Class Reference

A class to capture frames from a camera and publish them as ROS messages.

Inheritance diagram for camera_capture.CameraCapture:



Public Member Functions

- `def __init__(self)`
Initializes CameraCapture with a publisher, timer, video capture, and bridge.
- `def publish_image_data(self)`
Publishes image data.

Public Attributes

- `publisher_`
- `timer`
- `opencv_video`
- `bridge`

6.1.1 Detailed Description

A class to capture frames from a camera and publish them as ROS messages.

This class is a Node in ROS that uses the Picamera2 library for capturing video data, and CvBridge for converting between ROS and OpenCV image formats.

6.1.2 Constructor & Destructor Documentation

6.1.2.1 `__init__()`

```
def camera_capture.CameraCapture.__init__ (
    self )
```

Initializes CameraCapture with a publisher, timer, video capture, and bridge.

6.1.3 Member Function Documentation

6.1.3.1 `publish_image_data()`

```
def camera_capture.CameraCapture.publish_image_data (
    self )
```

Publishes image data.

Captures a frame from the video capture device, converts the image to a ROS message, and publishes the mess

6.1.4 Member Data Documentation

6.1.4.1 `bridge`

```
camera_capture.CameraCapture.bridge
```

6.1.4.2 `opencv_video`

```
camera_capture.CameraCapture.opencv_video
```

6.1.4.3 `publisher_`

```
camera_capture.CameraCapture.publisher_
```

6.1.4.4 timer

`camera_capture.CameraCapture.timer`

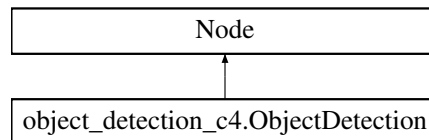
The documentation for this class was generated from the following file:

- [camera_capture.py](#)

6.2 object_detection_c4.ObjectDetection Class Reference

A class to detect objects in an image and publish their locations as ROS messages.

Inheritance diagram for `object_detection_c4.ObjectDetection`:



Public Member Functions

- `def __init__ (self)`
Initializes ObjectDetection with a subscriber, bridge, FPS reader, and publisher.
- `def is_circle (self, cnt, threshold=0.7)`
Determines if a contour is a circle.
- `def process_image (self, msg)`
Processes image data and publishes object locations.
- `def publish_dist_and_pos (self, x, y, distance)`
Publishes the distance and position of an object.

Public Attributes

- [subscription](#)
- [bridge](#)
- [fpsreader](#)
- [distance_and_position_publisher](#)

6.2.1 Detailed Description

A class to detect objects in an image and publish their locations as ROS messages.

This class is a Node in ROS that subscribes to image data, processes it to find objects, and publishes the locations of these objects.

6.2.2 Constructor & Destructor Documentation

6.2.2.1 `__init__()`

```
def object_detection_c4.ObjectDetection.__init__ (
    self )
```

Initializes ObjectDetection with a subscriber, bridge, FPS reader, and publisher.

6.2.3 Member Function Documentation

6.2.3.1 `is_circle()`

```
def object_detection_c4.ObjectDetection.is_circle (
    self,
    cnt,
    threshold = 0.7 )
```

Determines if a contour is a circle.

Parameters

<i>cnt</i>	The contour to evaluate.
<i>threshold</i>	The circularity threshold. Defaults to 0.7.

Returns

bool True if the contour is a circle, False otherwise.

6.2.3.2 `process_image()`

```
def object_detection_c4.ObjectDetection.process_image (
    self,
    msg )
```

Processes image data and publishes object locations.

This function converts the ROS image message to an OpenCV format, finds objects in the image, and publishes their locations.

Parameters

<i>msg</i>	The ROS image message to process.
------------	-----------------------------------

6.2.3.3 publish_dist_and_pos()

```
def object_detection_c4.ObjectDetection.publish_dist_and_pos (
    self,
    x,
    y,
    distance )
```

Publishes the distance and position of an object.

This function creates and publishes a ROS message containing the x, y position and distance of an object.

Parameters

<i>x</i>	The x position of the object.
<i>y</i>	The y position of the object.
<i>distance</i>	The distance to the object.

6.2.4 Member Data Documentation

6.2.4.1 bridge

```
object_detection_c4.ObjectDetection.bridge
```

6.2.4.2 distance_and_position_publisher

```
object_detection_c4.ObjectDetection.distance_and_position_publisher
```

6.2.4.3 fpsreader

```
object_detection_c4.ObjectDetection.fpsreader
```

6.2.4.4 subscription

`object_detection_c4.ObjectDetection.subscription`

The documentation for this class was generated from the following file:

- [object_detection_c4.py](#)

Chapter 7

File Documentation

7.1 camera_capture.py File Reference

Classes

- class [camera_capture.CameraCapture](#)
A class to capture frames from a camera and publish them as ROS messages.

Namespaces

- namespace [camera_capture](#)

Functions

- def [camera_capture.main](#) (args=None)
Main function which initializes the ROS client library, creates a [CameraCapture](#) node, and spins.

Variables

- Users [camera_capture.C](#) : \Users\sin_p\OneDrive - USN\Dokumenter\Bachelor\Doxygen\Dokumentasjon\↔
Doxygen\Config4>doxypy -a -c "C:/Users/sin_p/OneDrive - USN/Dokumenter/Bachelor/Doxygen/Dokumentasjon/Doxygen/C
_capture.py"

7.2 object_detection_c4.py File Reference

Classes

- class [object_detection_c4.ObjectDetection](#)
A class to detect objects in an image and publish their locations as ROS messages.

Namespaces

- namespace [object_detection_c4](#)

Functions

- def [object_detection_c4.main](#) (args=None)
Main function which initializes the ROS client library, creates an [ObjectDetection](#) node, and spins.

Variables

- Users [object_detection_c4.C](#) : \Users\sin_p\OneDrive - USN\Dokumenter\Bachelor\Doxygen\Dokumentasjon\↔
 Doxygen\Config4>doxypy -a -c "C:/Users/sin_p/OneDrive - USN/Dokumenter/Bachelor/Doxygen/Dokumentasjon/Doxygen/C
 _detection_c4.py"

7.3 object_detection_v1.py File Reference

Namespaces

- namespace [object_detection_v1](#)

Functions

- def [object_detection_v1.calculateDistance](#) (ballRadius_px)
Calculate the distance from the camera to the object based on its radius in pixels.
- def [object_detection_v1.detect_colored_object](#) (colorLower, colorUpper, min_radius, max_radius)
Detect a colored object within a given color range and size.
- def [object_detection_v1.display_object_info](#) (frame, x, y, radius, distance, color, text_offset)
Display information about the detected object on the frame.

Variables

- Users [object_detection_v1.C](#) : \Users\sin_p\OneDrive - USN\Dokumenter\Bachelor\Doxygen\Dokumentasjon\↔
 Doxygen\Config4>doxypy -a -c "C:/Users/sin_p/OneDrive - USN/Dokumenter/Bachelor/Doxygen/Dokumentasjon/Doxygen/C
 _detection_v1.py"
- float [object_detection_v1.ballRadius](#) = 3.25
- float [object_detection_v1.cameraFOV](#) = 62.2
- tuple [object_detection_v1.faktor](#) = (1280 / 2) * (ballRadius / math.tan(math.radians(cameraFOV / 2)))
- dict [object_detection_v1.colors](#)
- FPS [object_detection_v1.fpsreader](#) = FPS()
- cv [object_detection_v1.videoCap](#) = cv.VideoCapture(0)
- [object_detection_v1.grabbed](#)
- [object_detection_v1.frame](#) = imutils.resize(frame, width=1280)
- [object_detection_v1.fps](#)
- [object_detection_v1.img](#)
- [object_detection_v1.color](#)
- cv [object_detection_v1.hsv](#) = cv.cvtColor(frame, cv.COLOR_BGR2HSV)
- def [object_detection_v1.obj](#)
- [object_detection_v1.x](#)
- [object_detection_v1.y](#)
- [object_detection_v1.ballRadius_px](#)
- def [object_detection_v1.distance](#) = calculateDistance(ballRadius_px)
- cv [object_detection_v1.key](#) = cv.waitKey(1)

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