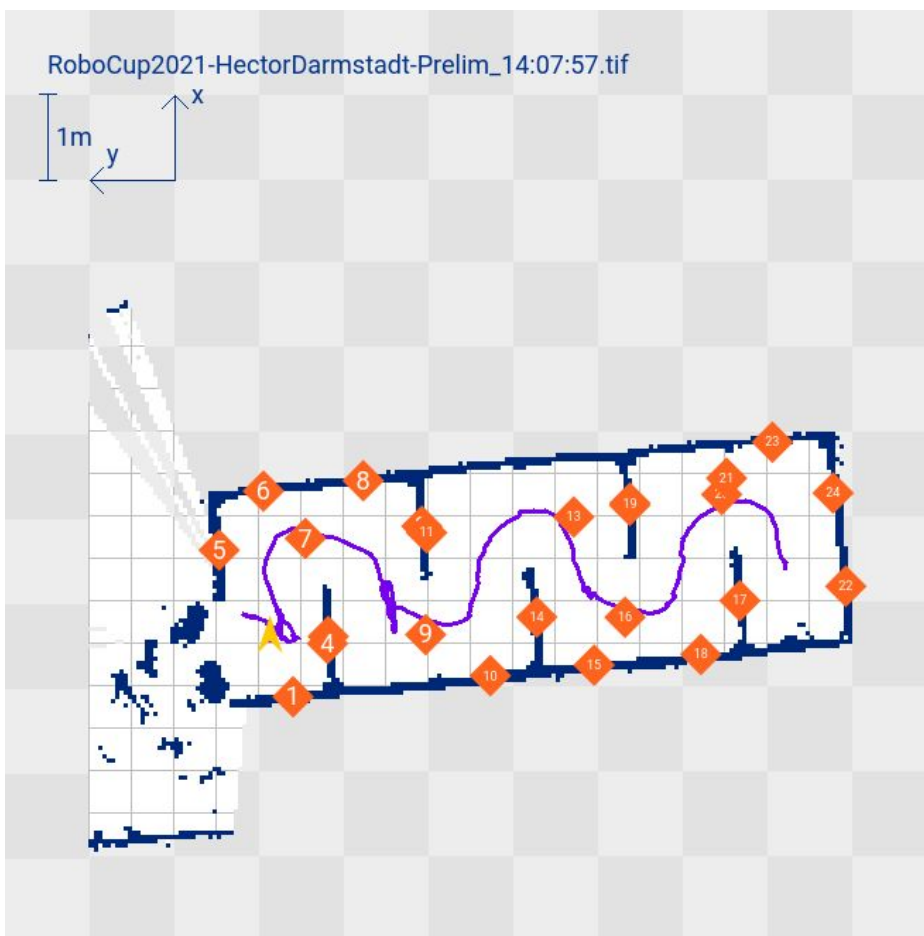# Mapping and Object Detection
Format Specifications

2D Map Format

2D maps have to be submitted in the specified [GeoTIFF](http://wiki.ros.org/hector_geotiff) format. An open-source implementation for ROS is available at http://wiki.ros.org/hector_geotiff.

Example map:

In the following, all elements of the map are described:

- **Fileformat:** [GeoTIFF](#)

- **FILENAME:** DARK BLUE (RGB: 0, 44, 207) TEXT
  For example, "RoboCup2019-TeamName-Mission1.tiff" displayed in the upper left corner to identify the map, make it sort properly in a directory, and findable on a computer.

- **MAP SCALE:** DARK BLUE (RGB: 0, 50, 140) TEXT AND EXACTLY 1 METER LONG LINE
  Display this in the upper right corner to indicate the scale of the map.

- **MAP ORIENTATION:** DARK BLUE (RGB: 0, 50, 140) TEXT ("X" AND "Y") AND ABOUT 50 cm LONG ARROWS
  Display this next to the map scale. It gives the orientation for the victim location in the victim file. Must be a right handed coordinate system: X points upwards, Y to the left.

- **UNEXPLORED AREA GRID:** LIGHT/DARK GREY (RGB: 226, 226, 227/RGB: 237, 237, 238) CHECKERBOARD WITH 100CM SQUARES
  This solid checkerboard pattern should show the unexplored area and provide scale on all sides of the mapped area. It should also print in black and white without ambiguity with other areas potentially turned grey in the process.

- **EXPLORED AREA GRID:** BLACK (RGB: 190,190,191) GRID WITH 50CM GRID AND ABOUT 1 CM THICK LINES (use a one pixel line in the map)
  This grid should only appear in the explored area, behind any walls, victim locations, or other information. The grid should be aligned with the checkerboard pattern of the unexplored area, but twice as fine to allow visual inspection of wall alignments.

- **INITIAL ROBOT POSITION:** YELLOW (RGB: 255, 200, 0) ARROW
  This should mark the initial position of the robot and always be pointed toward the top of the map.

- **WALLS AND OBSTACLES:** DARK BLUE (RGB: 0, 40, 120) FEATURES
  This should indicate the walls and other obstacles in the environment. The color should make the walls stand out from everything else.

- **SEARCHED AREA:** WHITE CONFIDENCE GRADIENT (RGB: 128, 128, 128 to RGB: 255, 255, 255)
  This should be based on the confidence that the area is really free. It should produce a clean white when seen as free by all measurements and nearly untouched when undecided, that is, nearly equally seen as occupied as free, to produce a dither effect.

- **CLEARED AREA:** LIGHT GREEN CONFIDENCE GRADIENT (RGB: 180, 230, 180 to RGB: 130, 230, 130)
  This should show the area cleared of victims with confidence. This should also factor in the actual field of view and range of onboard victim sensors – noting that victim sensors don't typically see through walls!

- **VICTIM LOCATION:** SOLID RED (RGB: 240, 10, 10) CIRCLE WITH ABOUT 35CM DIAM CONTAINING WHITE (RGB) TEXT "#"
  This should show the locations of victims with a victim identification number such as "1" in the order they were found. Additional information about this victim should be in the victim file noted below. Make sure the victim location is always on top of everything else!

- **HAZARD LOCATION:** SOLID ORANGE (RGB: 255, 100, 30) DIAMOND WITH ABOUT 30CM SIDES CONTAINING WHITE (RGB) TEXT "#"
  This should show the locations of hazards with an identification number such as "1" in the order they were found. Additional information about this hazard should be in the hazard file noted below.

- **ROBOT PATH:** MAGENTA (RGB: 120, 0, 140) LINE ABOUT 2CM THICK
  This should show the robot path.

Identified Objects Format

In addition to indicating identified objects in the map, they have to be submitted in a CSV list. In the following, the structure of the file is given:

Filename: RoboCup[Year]-[Teamname]-[Mission]-pois.csv

Format for the file header:

```
"pois"
"1.2"
"[Your team name]"
"[Your country]"
"[Start Date]"
"[Start Time]"
"[Mission]"

id,time,text,x,y,z,robot,mode,type
```

Replace the placeholders "[...]" with your data. Please leave the quotes in the file, but not the brackets.

The file body contains one line for each found object in the following format:

```
[id],[time],[text],[x],[y],[z],[robot],[mode],[type]
```

- **[id]:** Unique ID for each object that is also printed on the geotiff map
- **[time]:** Time stamp when the object was found
- **[text]:** QR code or other text if applicable
- **[x], [y], [z]:** Coordinates of the object in meters
- **[robot]:** Name of the robot that found the object
- **[mode]:** Mode of the robot when it found the object: **A** for autonomous, **T** for teleoperated
- **[type]:** Type of the object: victim, qrcode, door, hazmatsign, ...

Strings which include spaces should be enclosed with double quotes. Here is an example of a file which might be named "RoboCup2018-ReskoKoblenz-Prelim1-pois.csv":

```
"pois"
"1.2"
"Resko Koblenz"
"Germany"
"2018-06-23"
"14:37:03"
"Prelim1"

id,time,text,x,y,z,robot,mode,type
1,14:28:01,,-8.2992,-2.2904,0.49,"Robbie 1",A,victim
2,14:28:02,Y_1_2_chair_yokel,-8.2993,-2.2902,0.4563,"Robbie 2",T,qrcode
3,14:28:05,,-5.7452,-7.0849,0.2130,"Robbie 1",A,door
4,14:30:14,Y_2_1_ball_yeahs,-6.0845,-0.1251,0.3561,"Robbie 1",A,qrcode
5,14:32:56,Y_3_1_table_yolks,-9.2817,0.04968,0.7561,"Robbie 2",T,qrcode
```