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Review of the Bachelor Thesis „SW and HW Integration of an IP PTZ Camera onto a Mobile Outdoor Robot", presented from Jakub Chmel

The presented Bachelor Thesis from Jakub Chmel treat the integration of a PTZ camera to a given unmanned ground vehicle, UGV, a robot platform of the TRADR project, which is supported by FP7, the European Union's Research and Innovation funding programme. The TRADR project focuses in support of e.g. fire fighters by robots during a long term incident.

Mr. Chmel split the camera integration into two parts, software integration into ROS and hardware integration under a main aspect of withstanding the robot vibrations for an efficient incident exploration. A common aspect is the preparation of camera data transfer to an incident management system of the fire fighters. A challenge rises by the WiFi network bandwidth.

The Bachelor Thesis is well structured. The different aspects of camera integration were recognized and discussed. It is to be emphasised, that a chapter "Operator guide" for a quick camera start was added. An other significant aspect is the developed efficient handling of the PTZ camera. Considering the existing UGV concept the image of the integrated LadyBug 3 omnicamera can be used for a rapid alignment of the PTZ camera to a Point of Interest, a so called "controlling camera by mouse". Via calibration the data of the PTZ camera can be mapped with the data from the laser scanner, which gives the 3D-modell a realistic appearance. The presented examples, pictures and values, underline the argumentation and explain it effectively. A red thread is defined and followed. The differentiation between basic, physical and technical requirements for camera integration underlines a structured workflow.

A closer look to the details of the Bachelor Thesis raises questions. The motivation to the thesis does not explain the background of the TRADR project. Information about the aims of the project is missed,
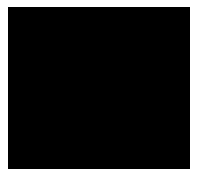
which could improve the understanding for the mentioned lack and the existing equipment on board of the robot. The argumentation concerning the integration of the PTZ camera does not clearly summarise the aspect of saved time for e.g. victim detection. To emphasise the necessity for an alternative to the LadyBug3 camera (LB3) some pictures of it with different zoom factors could give a better impression and point out its limit as done for the PTZ camera shown in fig. 6.3.

The argumentation in this thesis is correct and the conclusion consistent, even though not always clearly discussed. With some more short information, hints or in last consequent examples the understanding of the thesis can be improved.
The discussion about the requirements concerning the PTZ camera is comprehensive. The zoom factor description gives an impression, but is too general. The size of an object or the distance to it will not be closer specified.
The continuation of the started discussion and the conclusion will be done after the detailed description of SW development. Caused by this interruption the discussion focuses now more on the software details and the relation to it. The discussion about the results of the experiments will not be proceeded in the depth of detail it could be. The comparison of the two suggested camera positions offers only pictures taken from the PTZ camera but not from LB3. In consequence the front position seems to be better, because among others the LB3 "tower" doesn't disturb the view. Pictures taken with the LB3 could confirm the result with the rear position as the better one in accordance with the requirements.

A solution can't be offered for one of the main challenges withstanding the robot vibrations to provide a useable video for the operator. The problem was observed but not further investigated. The experiences show clearly that the vibrations reduce the advantage of the PTZ camera while the UGV is in motion.

Two questions will come:

- Which influence does the PTZ camera have on the performance of the system?
- Would the rear position be the best for the camera even if the stand design wouldn't obstruct the drivers view?

Final grade recommendation: B – very good.