miniATV goes WinterSIM
Test3 – Obstacle

Objective:

At the very beginning of my thesis work one of the possible goals was connecting the physical miniATV and the digital miniATV in such a way, that if one detects an obstacle, both will stop. With that feature, automatic driving functions, obstacle avoidance and emergency stopping could be tested without endangering the physical vehicle, it's surroundings or living beings.

My thesis then became more of a proof of concept with testing basic driving functions and quantifying the gap between the reality and this simulation, while this level of interconnectedness of the physical and digital twin fell outside of the scope of my thesis, I still wanted to show that it is possible to build upon my setup.

Necessary tools, devices and settings:

The same testing ground and basic code is used than in Test2, but the physical miniATVs emergency stop is re-used in the Laptop and put between the test script that is giving the commands for this test and between the nodes that directly receive the test commands (in the miniATV, that would be it's own emergency stop. Those emergency stop scripts only forward the commands to the actual topics, if there is no obstacle too close. If an obstacle is too close, a zero speed command is send out, since the physical miniATV doesn't have breaks.

In this very basic test, only the Lidar data are used, non of the other sensors and no other measurements are taken.

Both miniATVs drive, until in the WinterSIM an obstacle is too close and then it is noted down if any of the miniATVs stopped. If not, what happened (most likely?)

Code and data can be found here:

https://github.com/Lapland-Robotics/miniATV/tree/master's_thesis_cs/Testing/Test3-Obstacle

# test run	Did the WinterSIM miniATV stop?	Did the physical miniATV stop?	Notes
1	✓	✓	
2	✓	✓	
3	✓	✓	
4	✓	✓	
5	✓	✗	pt-mini ATV only stopped at the end of the 10s drive!
6	✓	✓	
7	✓	✓	
8	✓	✓	
9	✓	✗	No, didn't even start → was not yet ready for some reason?
10	✓	✓	

		Camera	ScreenRec	test start
#1	Video timer:	0:00,00	00:24,10	00:39,58
#2	"	0:00,00	00:18,65	00:26,69
#3	"	0:00,00	00:14,48	00:23,46
#4	"	0:00,00	00:09,42	00:19,45

→ The dt miniATV always ROLLED against the obstacle because the deceleration is not so instant as with the pt miniATV, but it clearly didn't keep the speed after the speed=0 command!

(right margin, bottom to top:) prob. human error: Would/might not yet available → dw dt-miniATV → dw obstacle in the way → dw step-sim → some sensor