

Team Smelý Zajko

Jozef Dúc, Ondrej Jariabka, Michal Moravčík,
Pavel Petrovič, Marek Šuppa

Comenius University, Bratislava



Robot (two years ago)



Robot (now)



Robot (umbrella solution)



- Parallax (Motor Mount and Wheel Kit), encoders, 2xHB25 motor drivers
- Sbot board (based on AVR ATmega128, low-level control board)
- PC ASUS (main control computer)
- Hokuyo laser sensor (UST-10LX)
- Ultrasonic sensors (5x SRF-08)
- GPS NaviLock NL-302U USB SiRF III
- Compass with tilt compensation (HMC6343)
- AVR ATmega8 (compass driver)
- Camcorder Panasonic SDR-T50
- Video grabber EasyCap DC60 USB 2.0 TV DVD VHS Video Adapter W / Audio
- Usual usb hub
- Power: lead accumulator - HAZE HZS 12V 9Ah
- Handmade wood & aluminum base
- Red power switch and power circuitry

What has happened this year

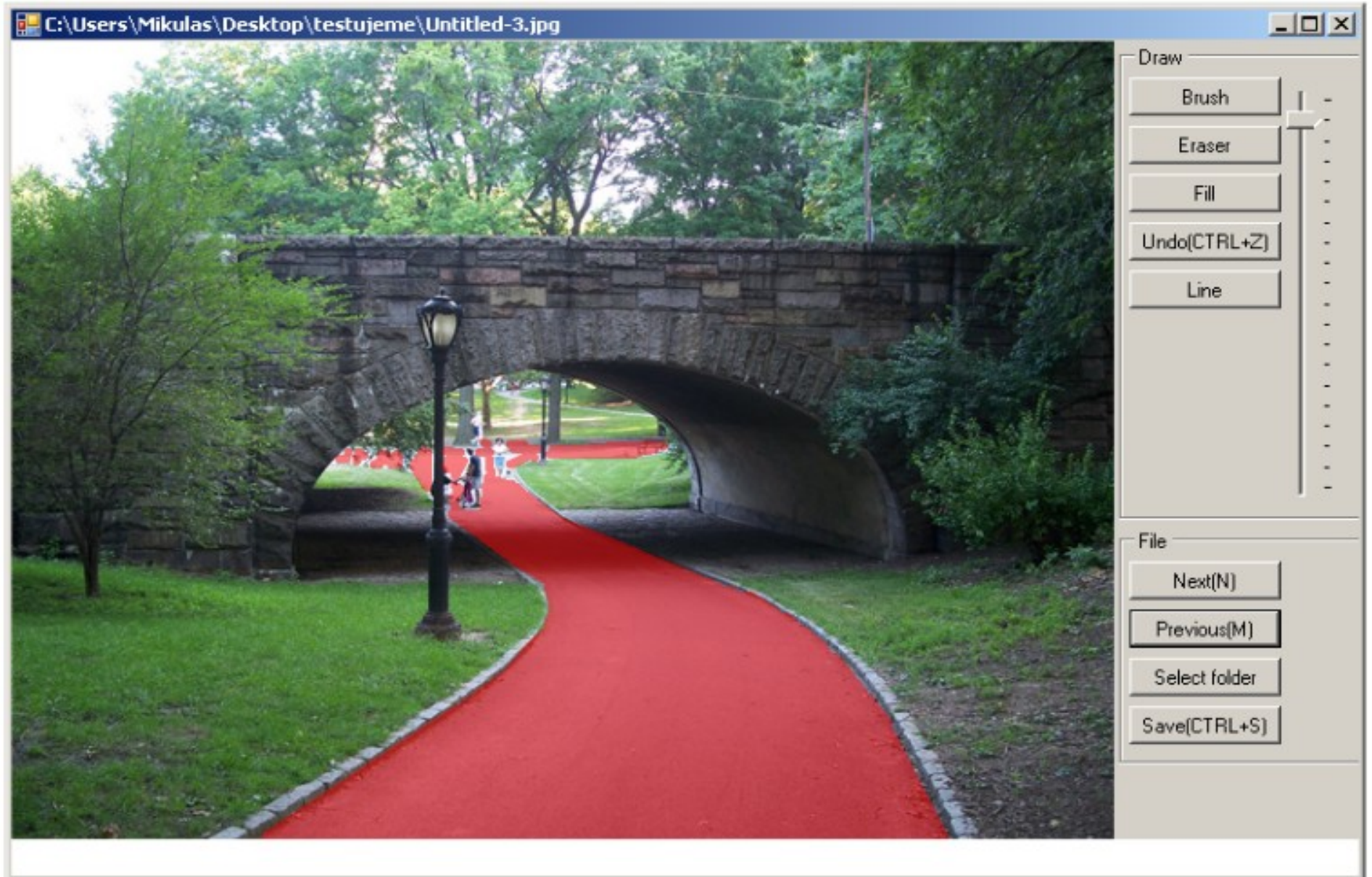
R1: we were hit from behind, alien robot was left at the crashed location for a minute, which confused our robot too much.

R2: Laser sensor was protected from rain above, but not from rain falling in 45 deg. direction => water drops on sensor were recognized as obstacles

R3: useful for us: we found a software bug

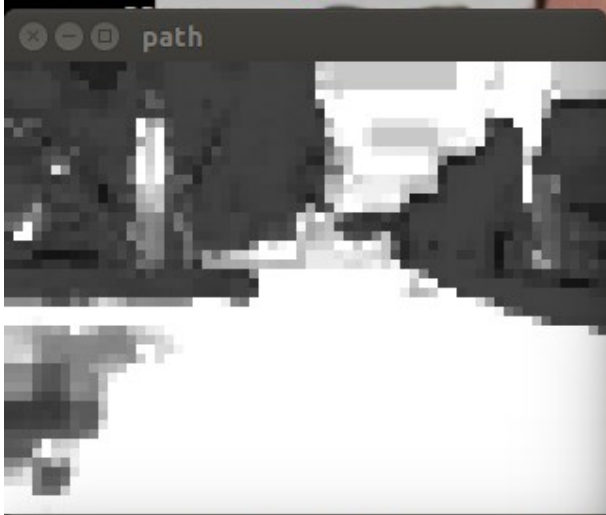
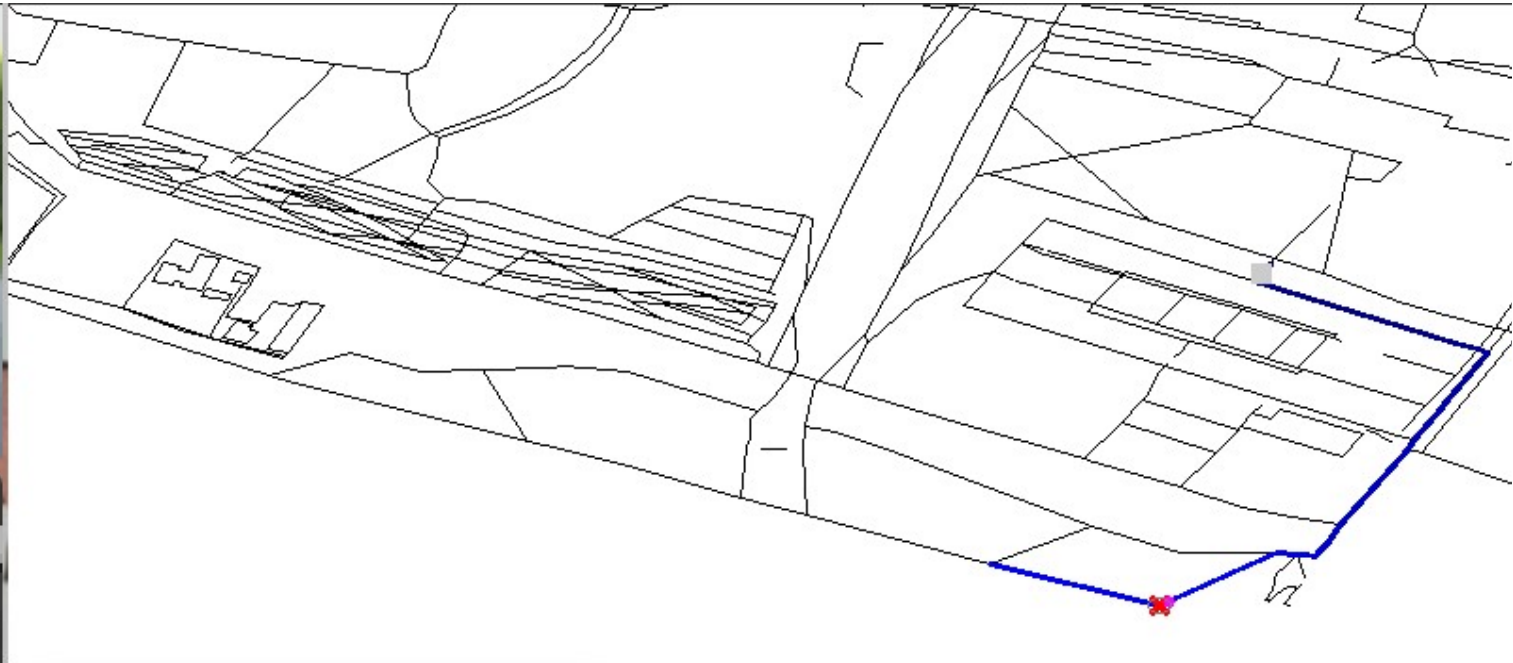
R4: robot hitting a stone on the bridge entrance, it was not prepared for vertical intersections

Main idea: ANN recognizes path



What is new

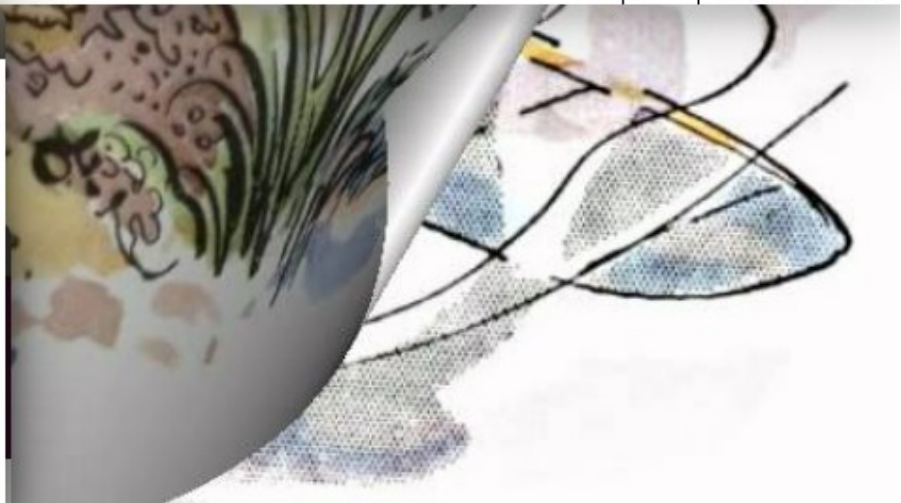
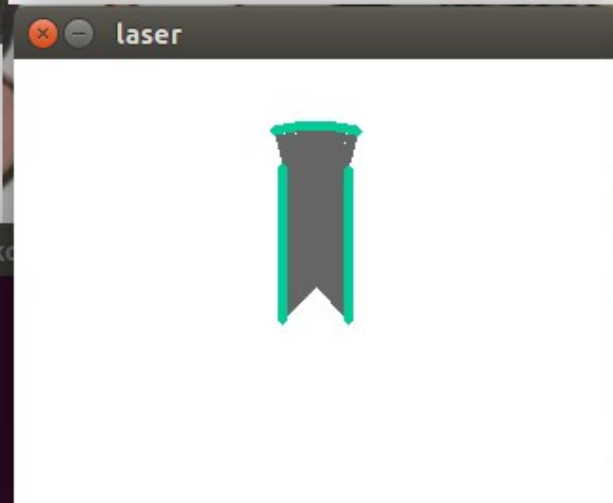
- Smelý zajko can speak
- Drives more straight (running mean)
- Hokuyo sensor has been moved from top to bottom front 12cm above ground (motivation: failures on curbs last year)
- A different method to process data from laser (still in progress)
- A large training set (532 images) and new neural network - training and data interpretation
- Small modifications: better visualization of laser and status data, possibility to run the system off-line without the robot, configuration file
- Idea for loading/unloading rope + hook :-)



gps ● ->curPos ✗ curPos ✗ ->dest  seg
5.57467e+02 0.577m 18

standby

+	08:54:13
-	08:58:05



```
navigation@pisek: ~/src/smely-zajko
T-235 seconds
T-235 seconds
T-235 seconds
T-235 seconds
T-235 seconds
T-235 seconds
```

Future ideas

- Tune and improve navigation based on laser data
- Convolutional neural networks
- HW control redesign (STM32)
- Overall movement speed-up
- Pick up and delivery
- Improve global navigation
- Probabilistic methods in local navigation
- Use GPU for image processing



References

- Miroslav Nadhajský: Robotour, master thesis, Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, 2011.
<http://dai.fmph.uniba.sk/~petrovic/th11/Nadhajsky.pdf>
- Michal Moravčík: Autonómny mobilný robot pre súťaž Robotour, master thesis, Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, 2015.
http://dai.fmph.uniba.sk/~petrovic/th15/Michal_Moravcik_Smely_Zajko.pdf
- Github software repository:
<https://github.com/Robotics-DAI-FMFI-UK/smely-zajko>
- Training data set with 532 images (5x5 patches):
http://dai.fmph.uniba.sk/projects/smelyzajko/robotour/data/training_all.zip