Praktikum: 7 & 8

Telebot system integration

Lecturers

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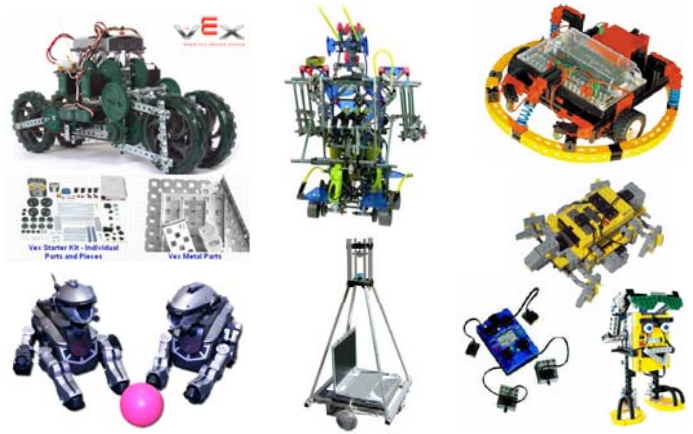


Possible tasks today's lecture

- Moving along a line
- Detecting and moving around an obstacle
- Looking for an object
- Following a moving object
- Mapping the scenario
- …

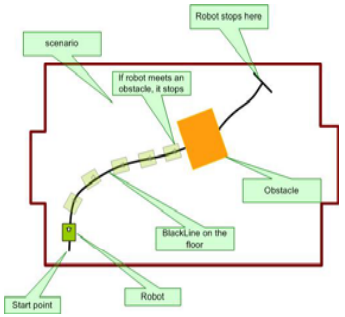
Web links for today's lecture

- **Telebot project**
  - http://tams-www.informatik.uni-hamburg.de/people/hzhang/projects/index.php?content=Telerobot

Moving along a black line

- **Task description:**
  - There is a black non-intersecting curve on the floor and the telebot moves along it. With the sensor feedback, it detects the black line, calculates its relative orientation in every system period and must implement the corresponding movement.
  - If the robot meets an obstruction in the scenario, it should avoid a collision.

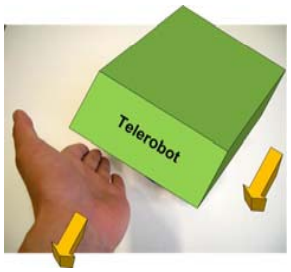
- **Suggestions:**
  - The infrared color sensor can detect the curve on the floor. The object sensors or the distance sensors can be used to detect obstructions in this task.



Following an object

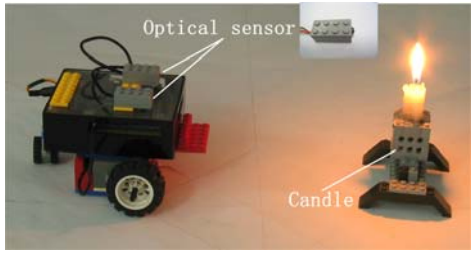
- **Task description:**
  - A moving object such as your hand can determine the telebot's movement. If you put your hand in front of the robot, or there is nothing in front of the telebot, the telebot stops. If you move your hand from the left front side of the telebot to its right front side, it turns right. If you move your hand from the right front side to the left front side, it turns left. If you move your hand slowly forward away from the telebot, it moves forward too.

- **Suggestions:**
  - Please choose two infrared sensors to determine the movement of the object.



Locating a fire

- **Task description:**
  - There is a luminous object such as an electric torch or a burning candle in the scenario (we use a burning candle in this task). Firstly, the robot should move randomly. If the telebot detects the fire, it moves to the candle, then stops. Adjust its relative orientation to the candle, in order to face the candle straight on.
- **Suggestions:**
  - Please use two optical sensors to detect the luminous object. A user must invoke the corresponding functions to configure the sensor input channels in analogue mode.



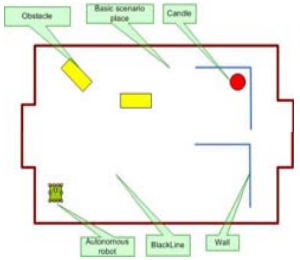
Mapping

- **Autonomous robots** are robots which can perform desired tasks in unstructured environments without continuous human guidance. Many kinds of robots have some degree of autonomy. Different robots can be autonomous in different ways.



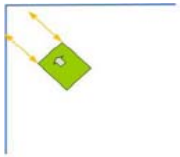
Mapping

- The problem of **robotic mapping** is related to cartography. The goal is for an autonomous robot to be able to construct (or use) a map or floor plan and to localize itself in it. Our scenario consists of :



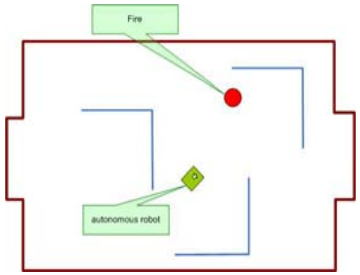
Mapping

- **Task 1 :** please build an autonomous robot to move in the scenario randomly without any crash.
- **Discussion:** how can a robot avoid a frontal/rear and a sidelong crash?
- **Suggestion:** use infrared to detect the object, in front and while build a mechanical part to detect the sidelong obstacles.
- **Discussion:** how to avoid a vicious circle?



Mapping competition

- **Task 2 :** control your robot to navigate in the scenario and find a object as fast as possible.



Time for your tasks…

A Jib Crane

- A jib crane is a mechanical lifting device equipped with a winder, wire ropes and sheaves that can be used both to lift and lower materials and to move them horizontally. Cranes are commonly employed in the transport industry for the loading and unloading of freight; in the construction industry for the movement of materials.

@Wiki

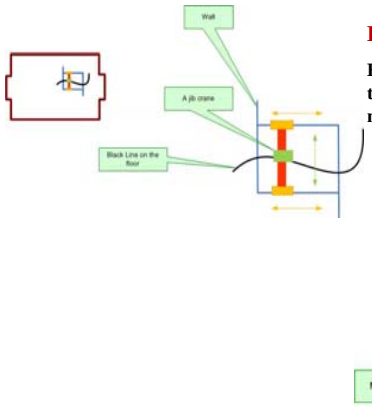
A Jib Crane

- **Task description:**
  - Use the telebot system to build a jib crane. The jib crane is often used in factories. It transports a heavy object from position A to position B.

- **Suggestions:**
  - Use sensors to avoid the sidelong crash. Use the color sensor to detect the object.

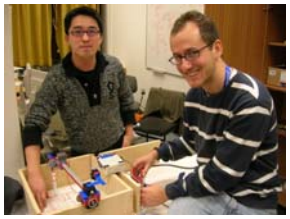
A Jib Crane

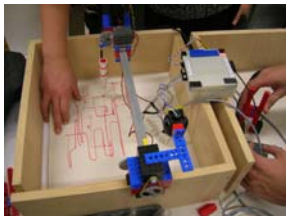
- We use two L-walls to build the scenario. The jib crane head moves along the black line. Please use two (or three) motors to control the movement.
- Build your mechanical part and control it with the CGUI, to make sure that the mechanical part of the jib crane can perform the task well.
- Please install the sensors to detect the black line and to avoid a crash at the stop position. You need sensors to control the movement performance of the movement.
- Please write your program and test it on your robot.
- Improve your robot (mechanical part or program part), if it does not work perfectly.



Discuss:

How can you control the robot so that the movement on rail A and rail B maintains the same speed?





Weining Zheng & Sören Leder

Let's begin…

Open topics

- So far, we have performed a few easy tasks with telebot system. In the following three lessons, every group should design a particular task and build a robot to implement it.
- The requirements are:
  - Use at least three sensors.
  - Use at least one PWM motor and one relay motor.
  - Develop you own original idea.

Time for your tasks …

Praktikum: 9

Introduction to modular robots and first try

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Thanks for your attention!

Any questions?