Search, Navigate, and Actuate

Overview

Adapted from: Arnoud Visser
Objectives

- Integrate the knowledge and skills acquired in the 1st year
- Initiate skills to plan, manage, execute and report a software project
- Introduce the knowledge needed for robotics

Adapted from: Arnoud Visser
Program

1\textsuperscript{th} Week: Search
    Find the next move for a chess playing robot
2\textsuperscript{nd} Week: Navigate
    Translate the move to movements of a piece
3\textsuperscript{rd} Week: Actuate
    Translate the piece movements to arm movements
4\textsuperscript{rd} Week: Play
    Do something no one else has done before

Adapted from: Arnoud Visser
Programming

playchess:

- board.gch
- gnuchess
- endgame solver

- move.txt
- path planner
- positions.txt

- umi robot
- robot commands
- umi simulator
- joints.txt
- inverse kinematics
2 hours: Lecture
Knowledge needed for the task

2 hours on average: Practicum with assistance (i.e. over the week: Tim, Michael Robrecht, Elise). The instructor in lead will explain details of assignment

4 hours on average: Practicum without assistance
Work together on the assignment. Only copy with citation of the source, can explain why copied and can explain content. No copies of fellow student’s material.

Adapted from: Arnoud Visser
1st Week: Programming skills
Instructors will grade your implementation of the chess endgame labbook

2nd Week: Knowledge
Leo Dorst will test your understanding of the syllabus; take home exam

3rd Week: Practical skills
Instructors will grade your demonstration and labbook of the chess playing robot

4th Week: Experimental skills
Instructors will grade your demonstration and paper of your survey

Adapted from: Arnoud Visser
The chess-playing Turk defeated Napoleon in 1769

Is this reliable information?
Norbert Wiener (1948) introduced a design for a chess program including minimax
Alan Turing (1951) wrote first full chess program
John McCarthy (1956) conceived alpha-beta search
AI has ‘solved’ the problem

Deep Blue wins with 3½-2½ in 1997

Adapted from: Arnoud Visser
Computer used to analyze human chess champions

![Bar chart showing the percentage of blunders for various world chess champions.]

- Capablanca: 0.0108
- Petrosian: 0.0145
- Karpov: 0.0149
- Kramnik: 0.0158
- Smyslov: 0.0185
- Kasparov: 0.0192
- Spassky: 0.0197
- Alekhine: 0.0230
- Lasker: 0.0234
- Fischer: 0.0264
- Tal: 0.0265
- Botvinnik: 0.0275
- Euwe: 0.0406
- Steinitz: 0.0539

Matej Guid and Ivan Bratko

Computer analysis of world chess champions

Adapted from: Arnoud Visser
IBM’s Jeopardy-winning computer is delving into medicine
Exponential increase in technical innovation

- By 2013, a supercomputer will have the reasoning and processing capacity of the Human Brain.
- By 2023, a $1,000 home computer will have the power of the human brain.
- By 2037, a $0.01 embedded computer will have the power of the human brain.
- By 2049, a $1,000 computer will have the power of the human Race.
- By 2059, a $0.01 computer will have the power of the human Race.
Now it is your turn to step in and create an engaging journey!