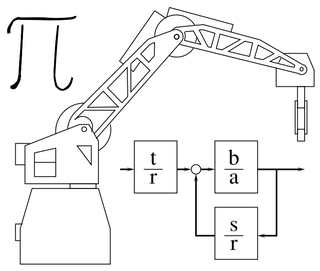
Robotics Controllers Hardware, Software and Algorithms Design



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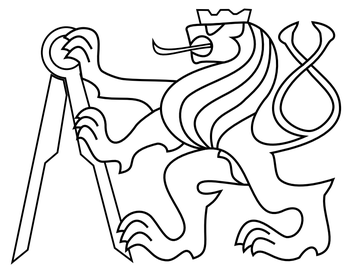
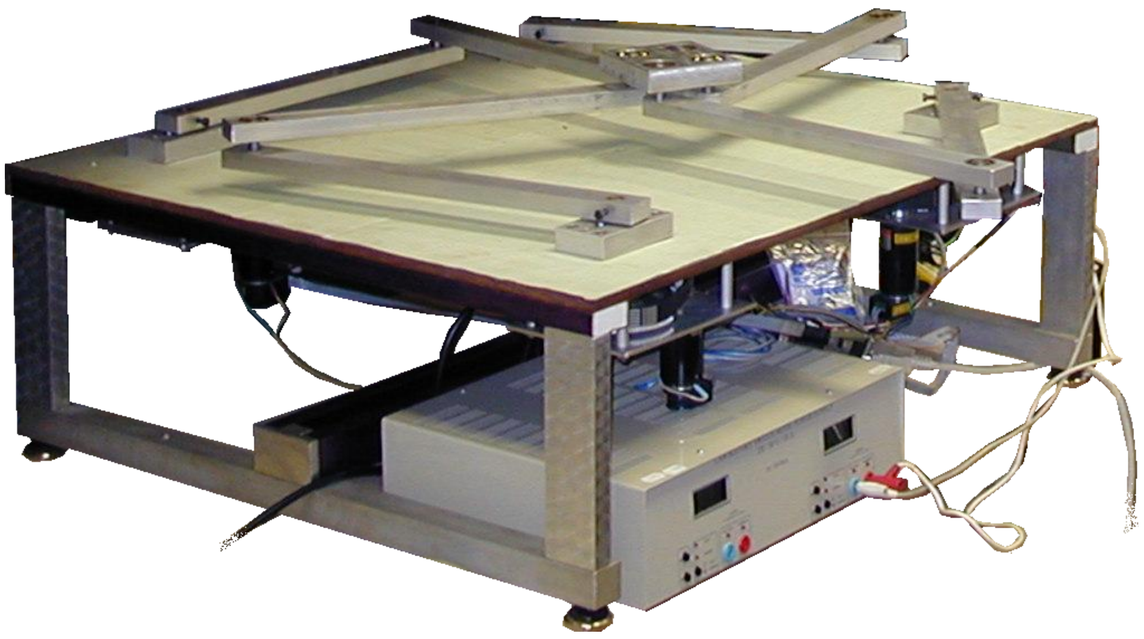
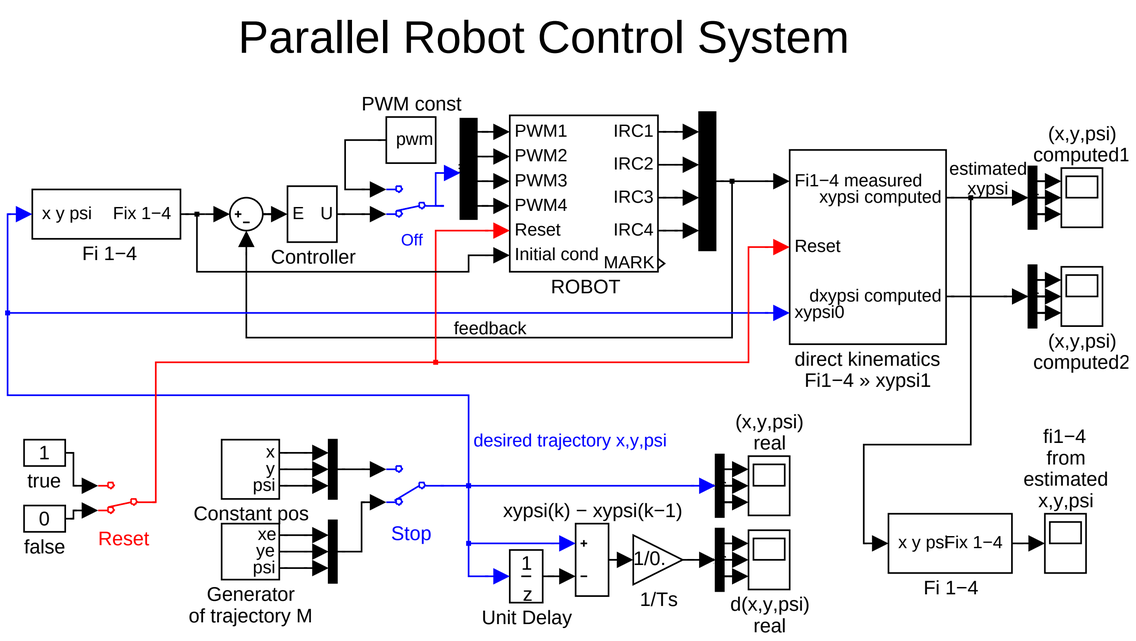


Parallel Robot

Main reasons for research of parallel alternative to classical serial joints and actuators connection is a promise to achieve higher stiffness for the parallel configuration of actuators. It is possible to develop such configuration of actuators, when all or almost all of the actuators do not move with the robot and do not contribute their mass to moving parts. Simpler inverse transformations are compensated by more difficult direct transformations. The problem of the direct kinematic and actual position in the independent coordinates can be solved by tracking of actual position in the motor coordinates with help of the Jacobian matrix of inverse transformations.



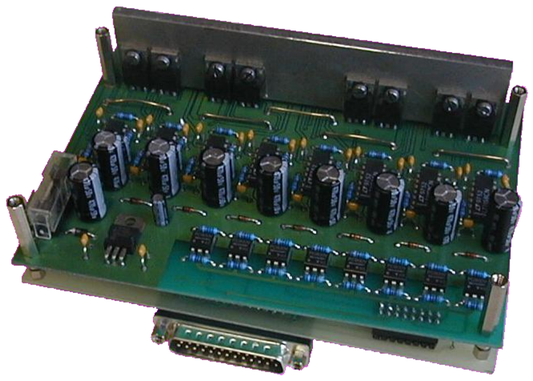
The extension hardware for DSP system was constructed for control of the laboratory model of the redundant parallel robot. Work on control algorithm design and application of it is in the progress. The modern, high-level design methods utilize Real Time Workshop, Matlab, Simulink and dSPACE DSP board for precise real-time control of fast DC motors.



Control Hardware

The real-time control algoritms run on dSPACE board based on TMS320C31 DSP.

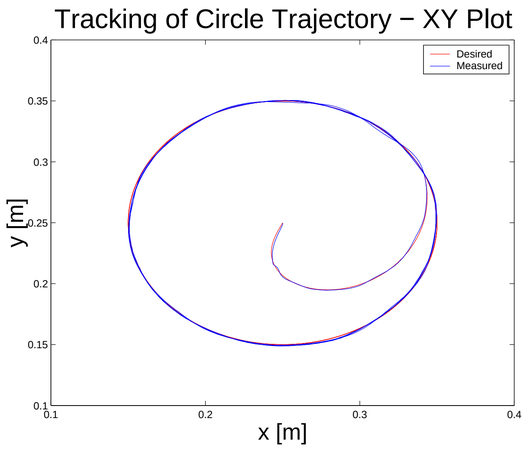
- 32 bit floating-point DSP
- 50 ns instruction execution rate
- 128 KWords of SRAM memory
- TMS320C14 I/O coprocessor with modified firmware for incremental encoders

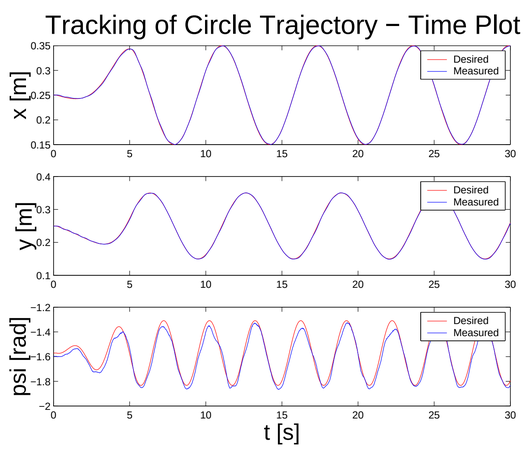


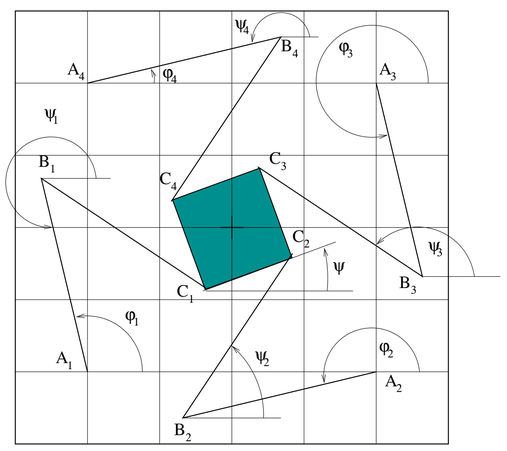
- Extension board with two CF32006 and six incremantal encoders inputs
- Power board for four 70 Watt Maxon DC motors

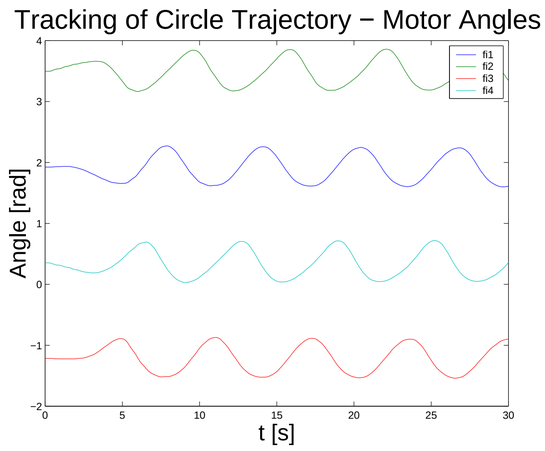
Measured Results

The control algorithms were developed by project members from UTIA. The coordinates transformations represent a result of our co-operation as well. The first results of experiments with the parallel robot motion can be seen in the next pictures.









Acknowledgement:

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