Realtime-Systems

Wintersemester 2024/2025

Lab-Work-Description

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Literaturverzeichnis

1) www.arduino.cc/en/Guide/Environment
2) www.arduino.cc/en/Tutorial/DueSimpleWaveformGenerator
3) https://gogs.es-lab.de/fstange/Raspi4_Echtzeit-Erweiterung

Ablauf

- Practical work contains mainly one experiment in Lab k31
  → Generation of stable rectancle signals incl. performance analysis
    - Arduino due (without OS)
    - Raspberry Pi (Standard Linux OS)
    - Raspberry Pi (Standard Linux with RT extension)

- Practical work can be done anytime in Lab in k31
- Practical work is a group activity (2 persons) and consists of ca. 10 UE

- Succsessful practical work is necessary to join examination
- Examination consists of 15-20min oral discussion at the end of the semester based on content of lecture and practical work

1: Detail Tasks: Part 1a

- Get fimilar with the arduino in general (see download link)
- Get fimilar with the specifics of arduino due (see download link)
- Connect the arduino due board
- Start the arduino IDE
- Use the example sketch „blink“, compile it, download it to the due board and check the basic working
- Generate different waveforms from example in Ref 2 (see download link) and observe them with oszilloscope
- Try to find the max. frequency by modifying the sketch from Ref 2
- Try to measure the spread of each frequency with oszilloscope and spectrum analyser
- Investigate the reason for the remaining jitter and try to find an improvement

1: Detail Tasks: Part 1b

- Connect your Raspberry Pi to the network and login at the Pi as user pi (password: raspberry)
- Follow the instruction at Ref 3 for generating rectangle signals w/o RT extension and with RT extension of the kernel
- Write a small python programm to generate “Random Numbers“ and put them into a file
- Let the „Random Number“ program and the „reactangle program“ run in parallel and check frequency and spread on the Raspberry Pi w/o and with RT extension.
- Discuss all three methods of signal generation with pro's and con's.

The End.