Begleitendes Wahlpflichtfach SPS

- FH CAMPUS 02 Automatisierungstechnik
- **Bernhard Forjan / Daniel Oswald / Manuel Knittelfelder / Diana Lemian / Bernhard Pacher / Gernot Pacher**

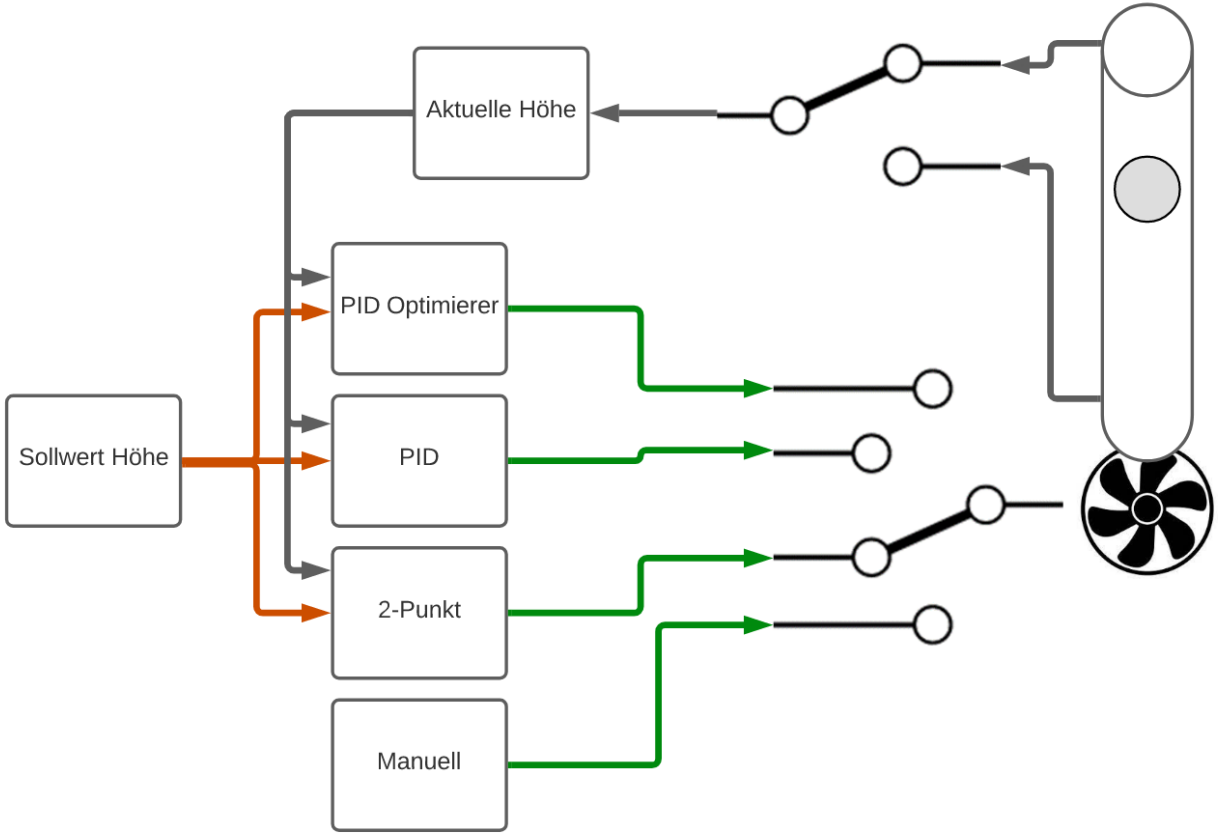
Agenda

- Projekte:
- Regelung eines Tischtennisballs im Luftkanal
- Drehzahlregelung eines Lüfters
- Heater control via PID or 3 point controller

Regelung eines Tischtennisballs im Luftkanal

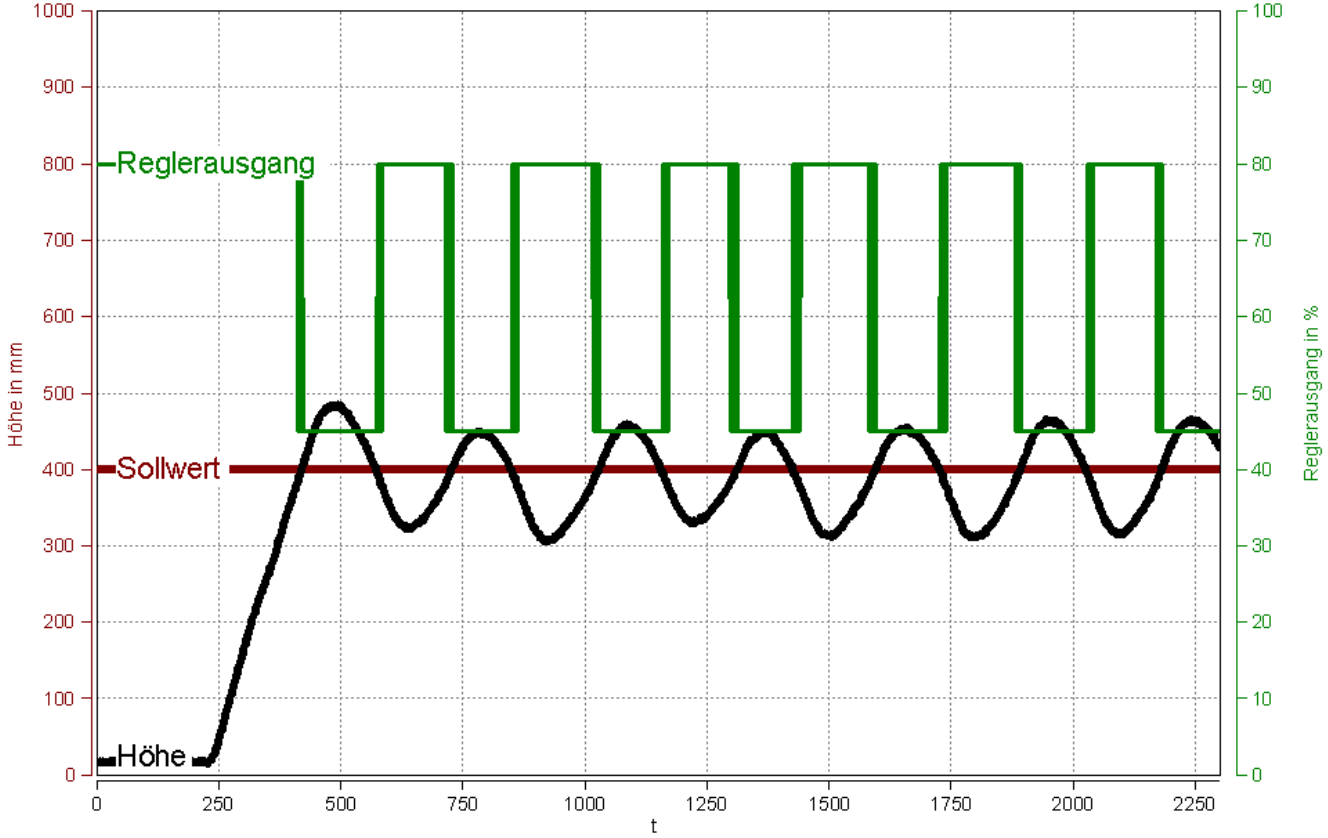
- Umschaltung der Reglerart / Sollwertvorgabe für Lüfter
  - PID-Regler
  - Optimierung
  - 2 Punkt-Regler
  - Manuelle-Eingabe
- Umschaltung zwischen 2 Sensortypen
  - Ultraschallsensor und Laserdistanzsensor

Übersicht

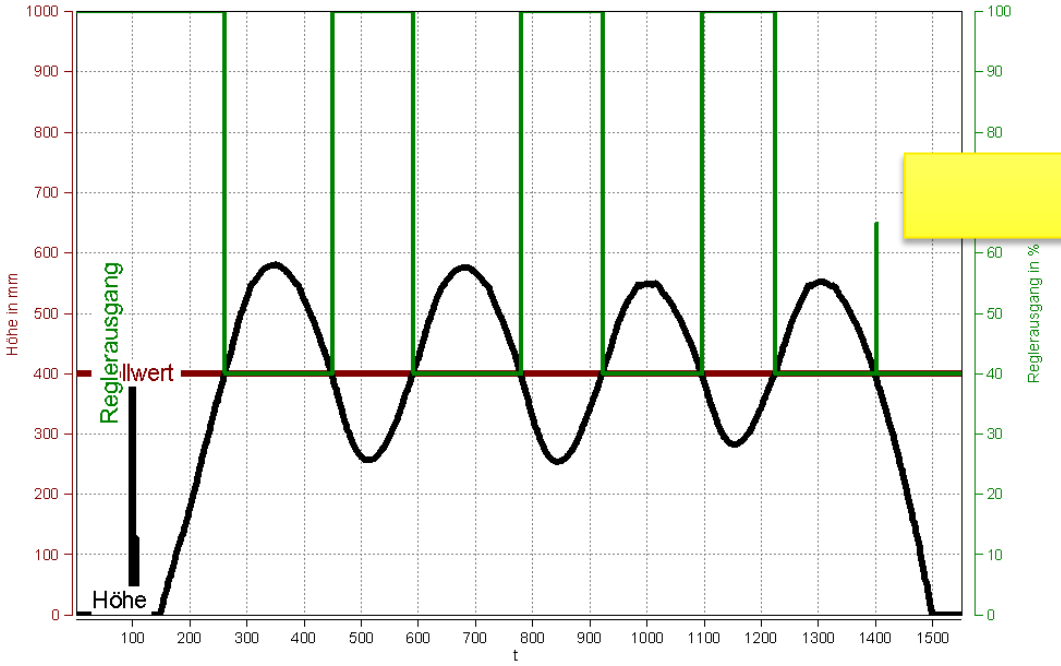

Aktuelle Höhe
PID Optimierer
Sollwert Höhe
PID
2-Punkt
Manuell


420
SIMULATION

2-Punktregler



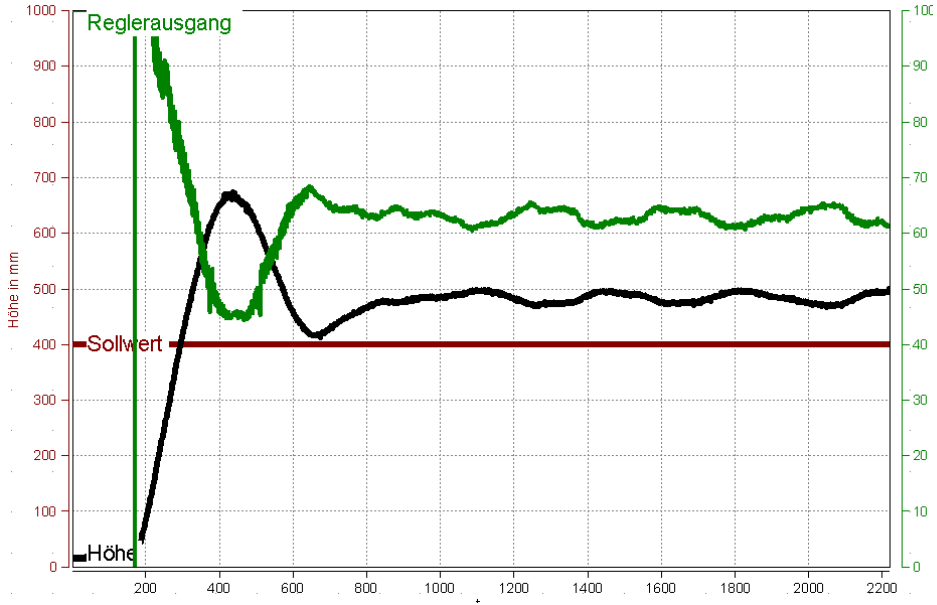
PID-Optimierer



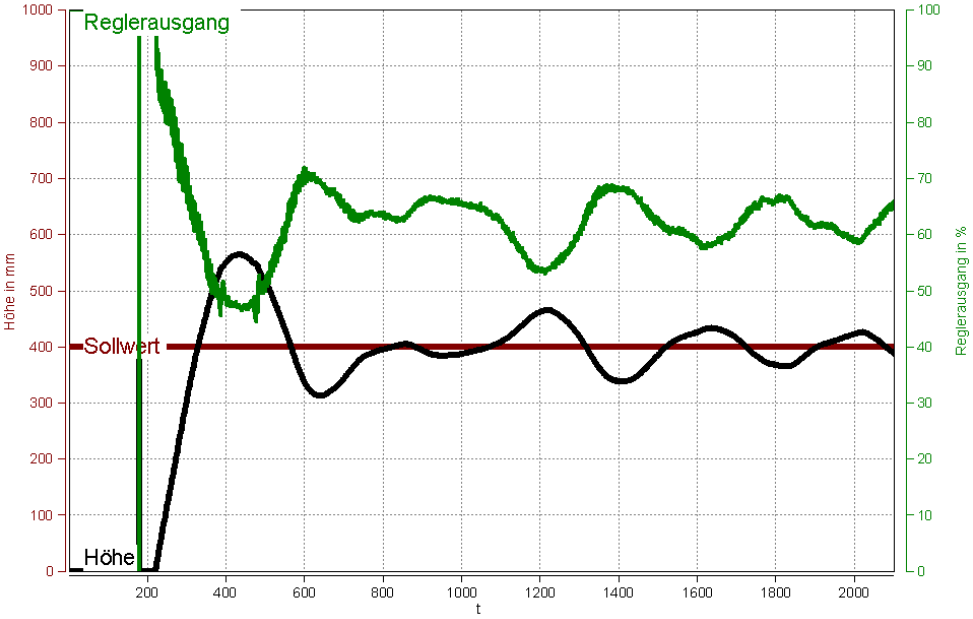
	Ultraschall	Laser
K	0.15	0.11-0.16
I	1.57	1.68-1.57
D	0.37	0.40-0.38
Regelgüte	92%	86-96%

PID-Regler

Laserdistanz-Sensor

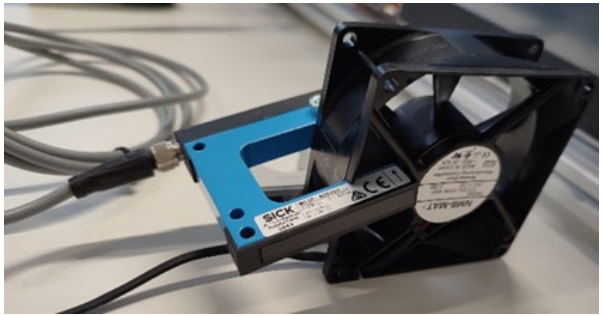


Ultraschall-Sensor



Drehzahlsteuerung eines Lüfters

- Infrarot Gabelsensor
- Regler zur Drehzahleinstellung



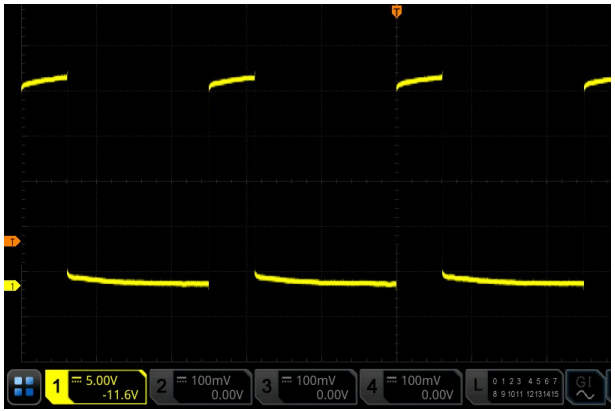
Regler zur Drehzahlsteuerung

Visualisierung

Drehzahlregelung mittels PWM

- Konstante Frequenz
- Feste Amplitude
- Rechteckimpuls variiert in der Weite

20%

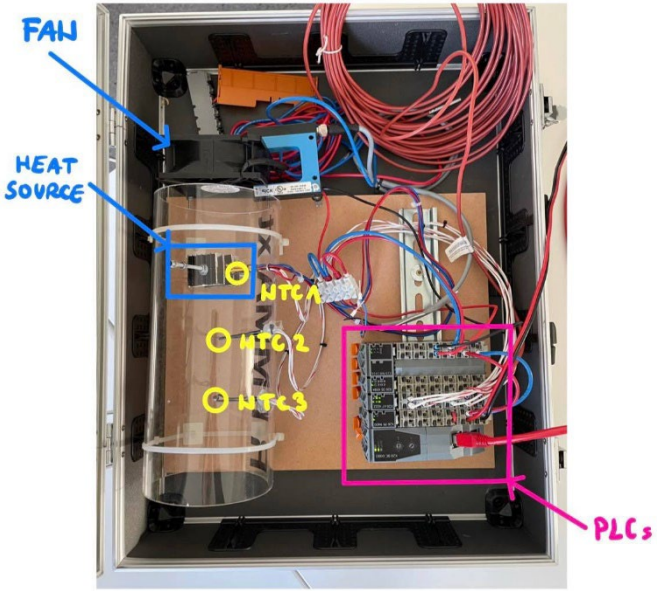


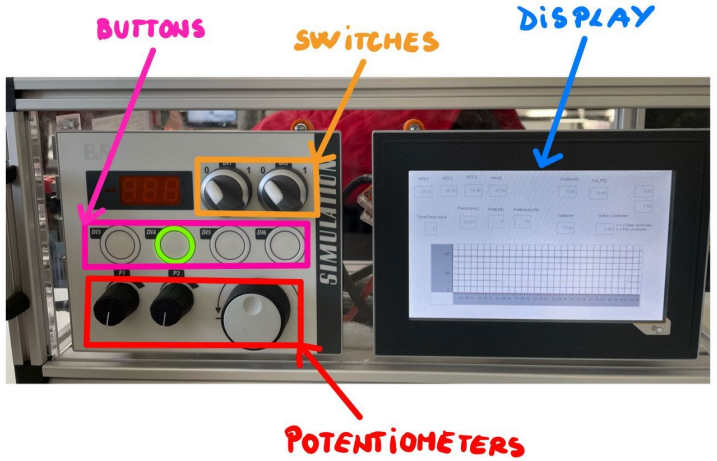
50%

100%

Heater control via PID and 3 point controller

- Experimental set up





Heater control via PID and 3 point controller

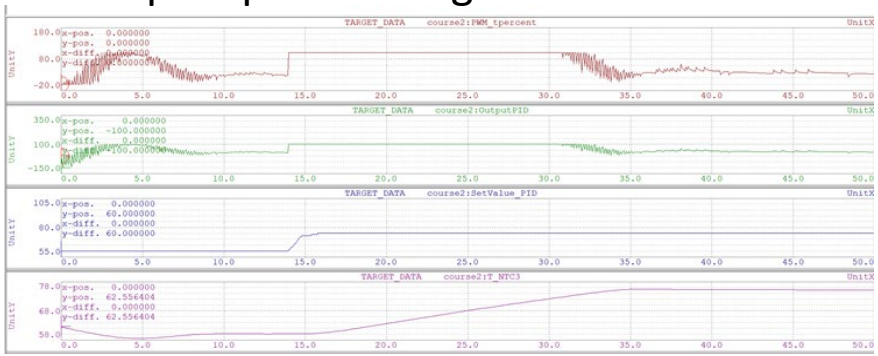
- Autotuning PID controller

Only set value as
Input necessary

MTBasicsOscillationTuning_0	MTBa	lo	
Enable	BOOL		TRUE
SetValue	REAL		50.0
MinOut	REAL		-100.0
MaxOut	REAL		100.0
Invert	BOOL		FALSE
Update	BOOL		FALSE
ActValue	REAL		48.41761
Start	BOOL		TRUE
Active	BOOL		TRUE
Error	BOOL		FALSE
StatusID	DINT		0
UpdateDone	BOOL		FALSE
Out	REAL		19.371727
TuningActive	BOOL		FALSE
TuningDone	BOOL		TRUE
Quality	REAL		83.59096
PIDParameters	MTPID		
Gain	REAL		64.815155
IntegrationTime	REAL		4.76244259
DerivativeTime	REAL		1.14298618
FilterTime	REAL		0.114298619

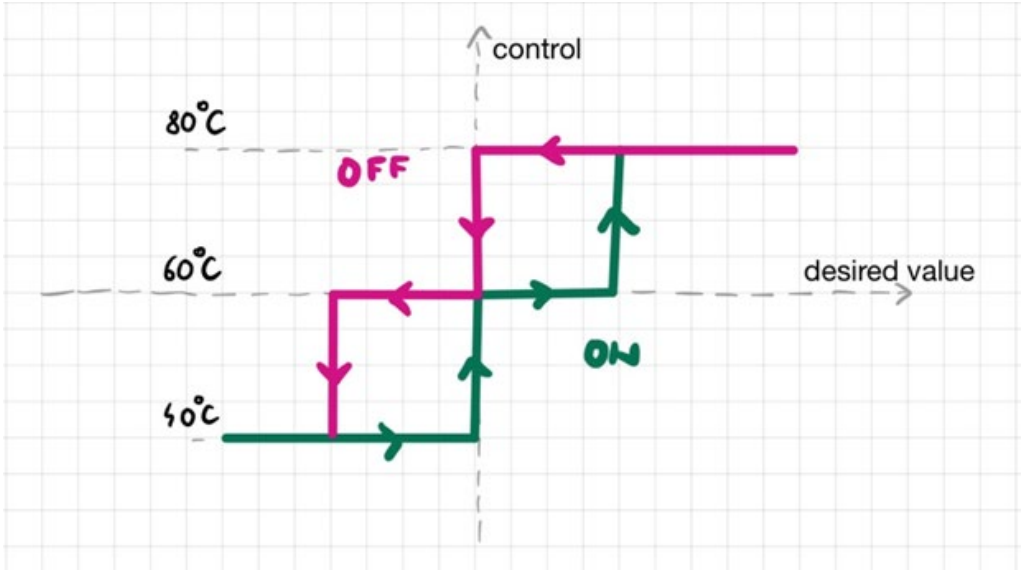
Modelled step response for temperature sensor

Step response using PID controller



Heater control via PID and 3 point controller

- Working principle for 3 point controller



- Setting accuracy by changing the threshold values
- Output value is not always the desire one (oscillating)

Heater control via PID and 3 point controller

- Difficulties during project
  - Setup NTC sensors / Visualization B&R / Naming variables

Comparison:

PT 100

```
(*temp sensors*)
T_PT100_R := R_PT100;
T_PT100 := T_PT100_R/10;
```

NTC

```
(*R_NTC1_R := R_NTC1;
R_NTC1_C := R_NTC1_R/10;
T_NTC1 := 1/((LN(R_NTC1_C/R_25)/Beta)+(1/T_25)) - 273.15;
(*function block NTC calc*)
T_NTC1 := temp_convert(1000,3730,R_NTC1,T_25);
```

Datasheet NTC:

Electrical specification and ordering codes

R_{25} Ω	No. of R/T characteristic	$B_{25/100}$ K	Ordering code
15	1203	2900 ±3%	B57164K0150+000
22	1203	2900 ±3%	B57164K0220+000
33	1203	2900 ±3%	B57164K0330+000
47	1302	3000 ±3%	B57164K0470+000
68	1303	3050 ±3%	B57164K0680+000
100	1305	3200 ±3%	B57164K0101+000
150	1305	3200 ±3%	B57164K0151+000
220	1305	3200 ±3%	B57164K0221+000
330	1306	3450 ±3%	B57164K0331+000
470	1306	3450 ±3%	B57164K0471+000
1 k	1011	3730 ±3%	B57164K0102+000
2.2 k	1013	3900 ±3%	B57164K0222+000
3.3 k	4001	3950 ±3%	B57164K0332+000

```
(*fan control*)
Period_Fan ;
PWM_Fan ;
Period_Fan := Period_INT ;
Period_INT := Analog1 ;
PWM_Fan := Analog2 ;
PWM_percent := (Analog2*100)/32767;
```

Vielen Dank für Eure Aufmerksamkeit