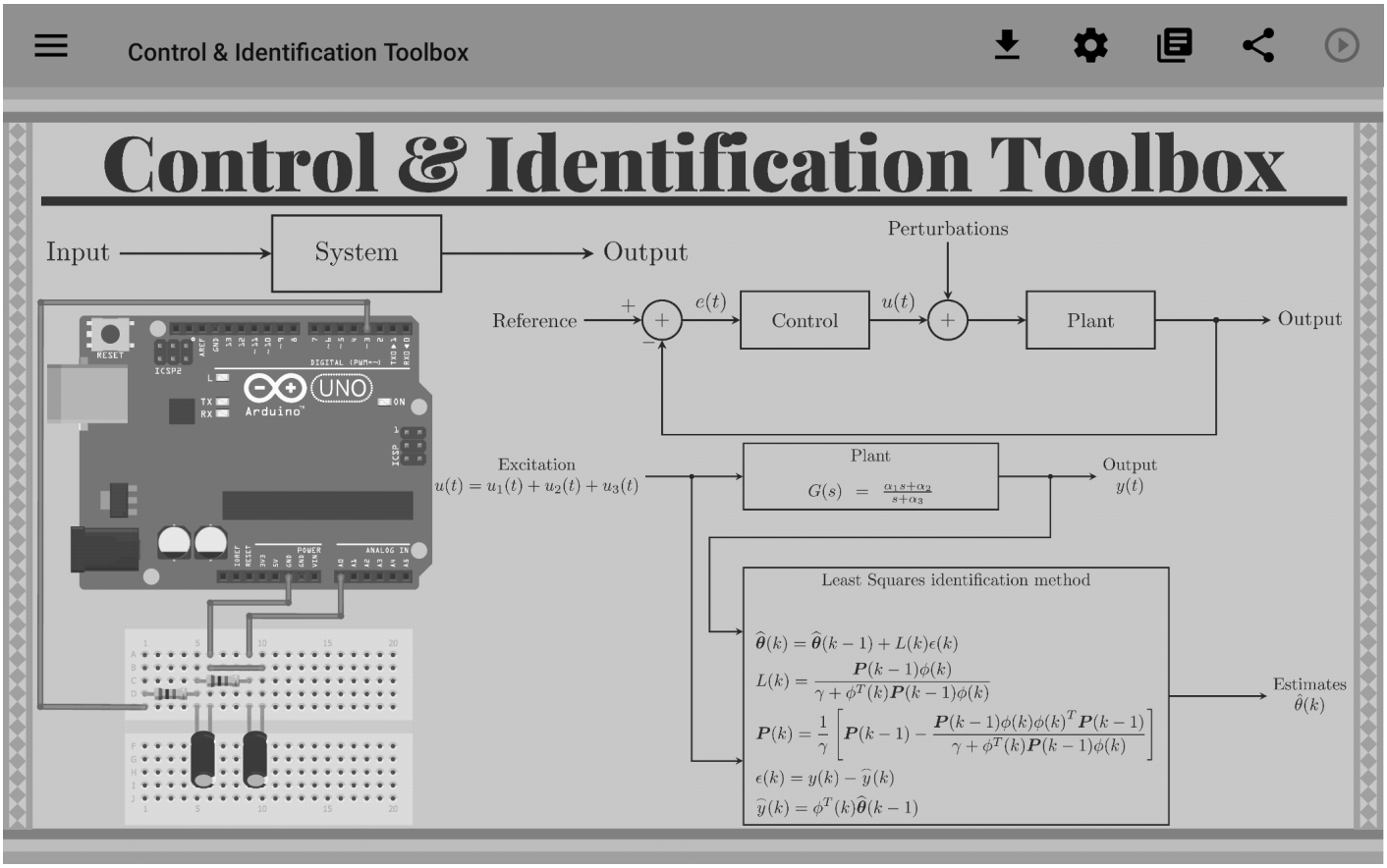


Figure 1: Home-screen of the CIT android application

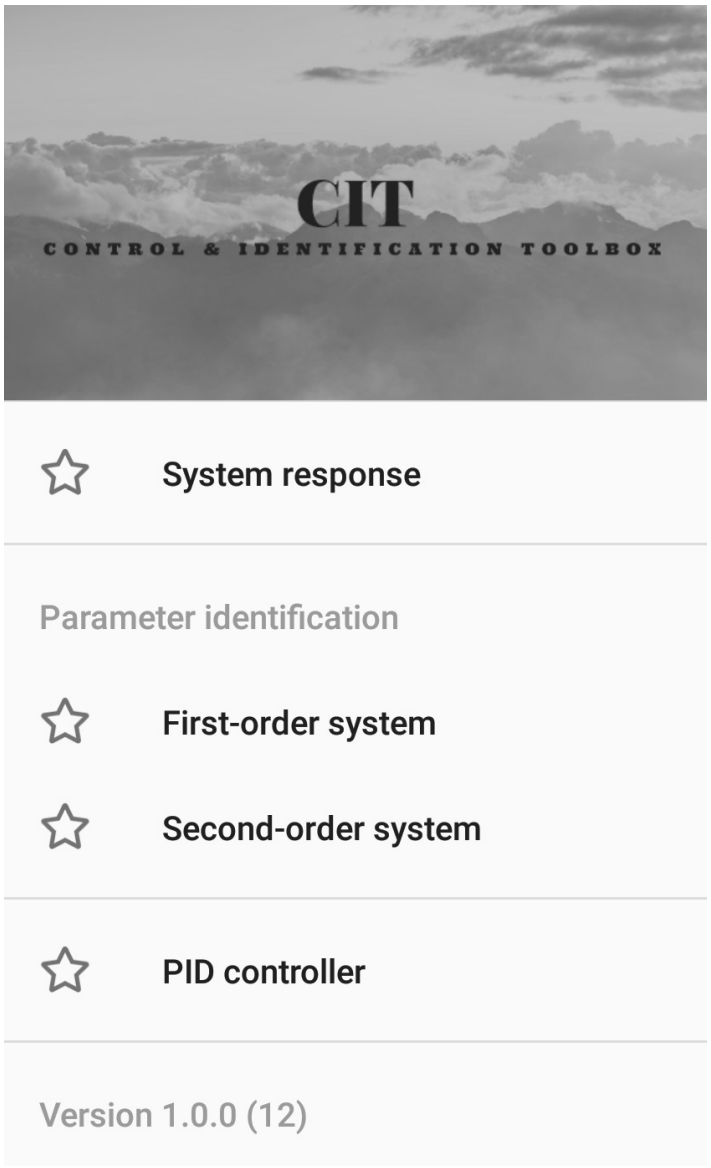


Figure 2: Drawer of the CIT android application

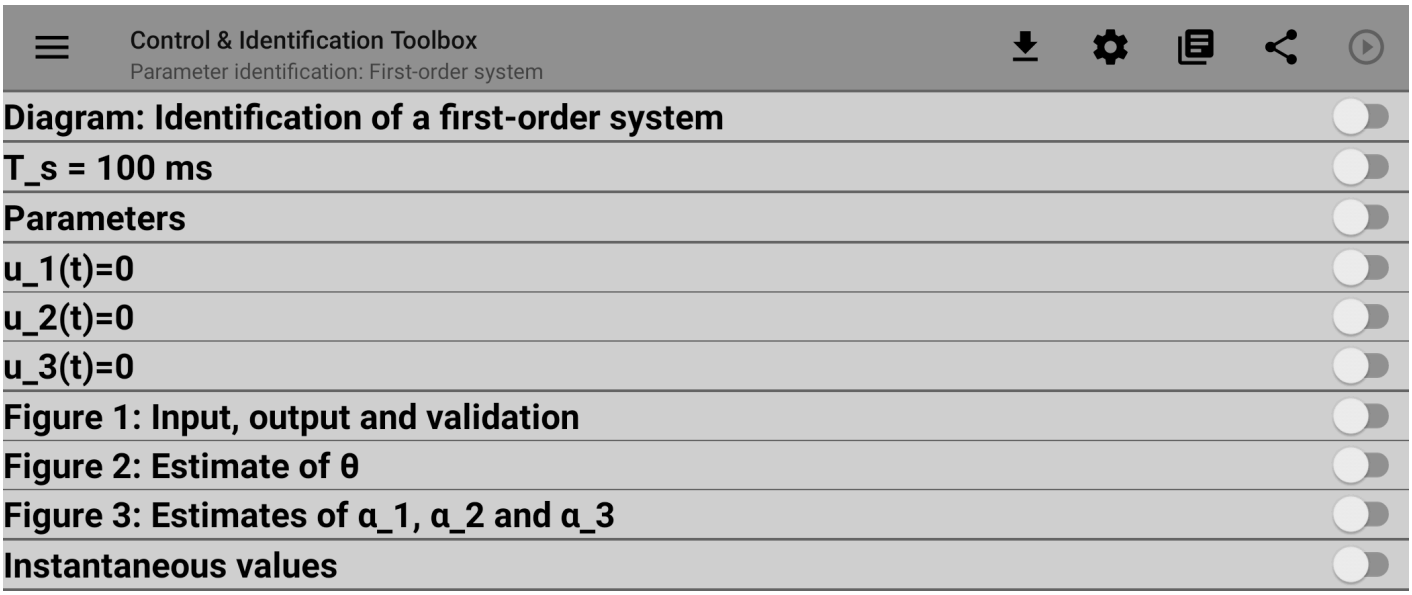


Figure 3: Experimental results screen (ERS) for first-order parameter identification

```
1:  Initialize USB CDC to the boudrate = 115 200 bit s^-1
2:  while 1 do
3:      Receive from USB and store in A
4:      if A[0] == 0x34 then
5:          Set the value of A[2] as PWM out to the Analog
        output port # A[1]− 0x60
6:      end if
7:      if A[0] == 0x33 then
8:          Read analog value from the Analog input # A[1]−
        0x60 and send the value to USB
9:      end if
10: end while
```

Figure 4: Bridge device's firmware

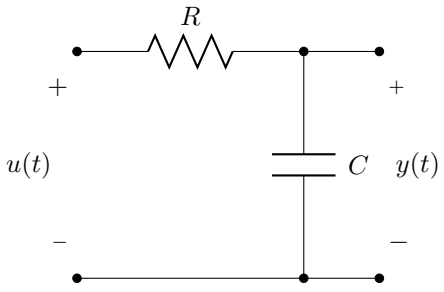


Figure 5: First order low pass filter

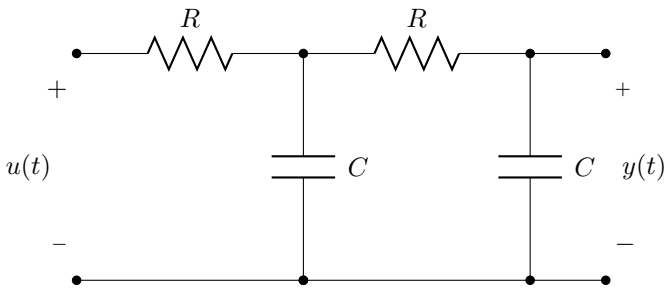


Figure 6: Second order low pass filter.

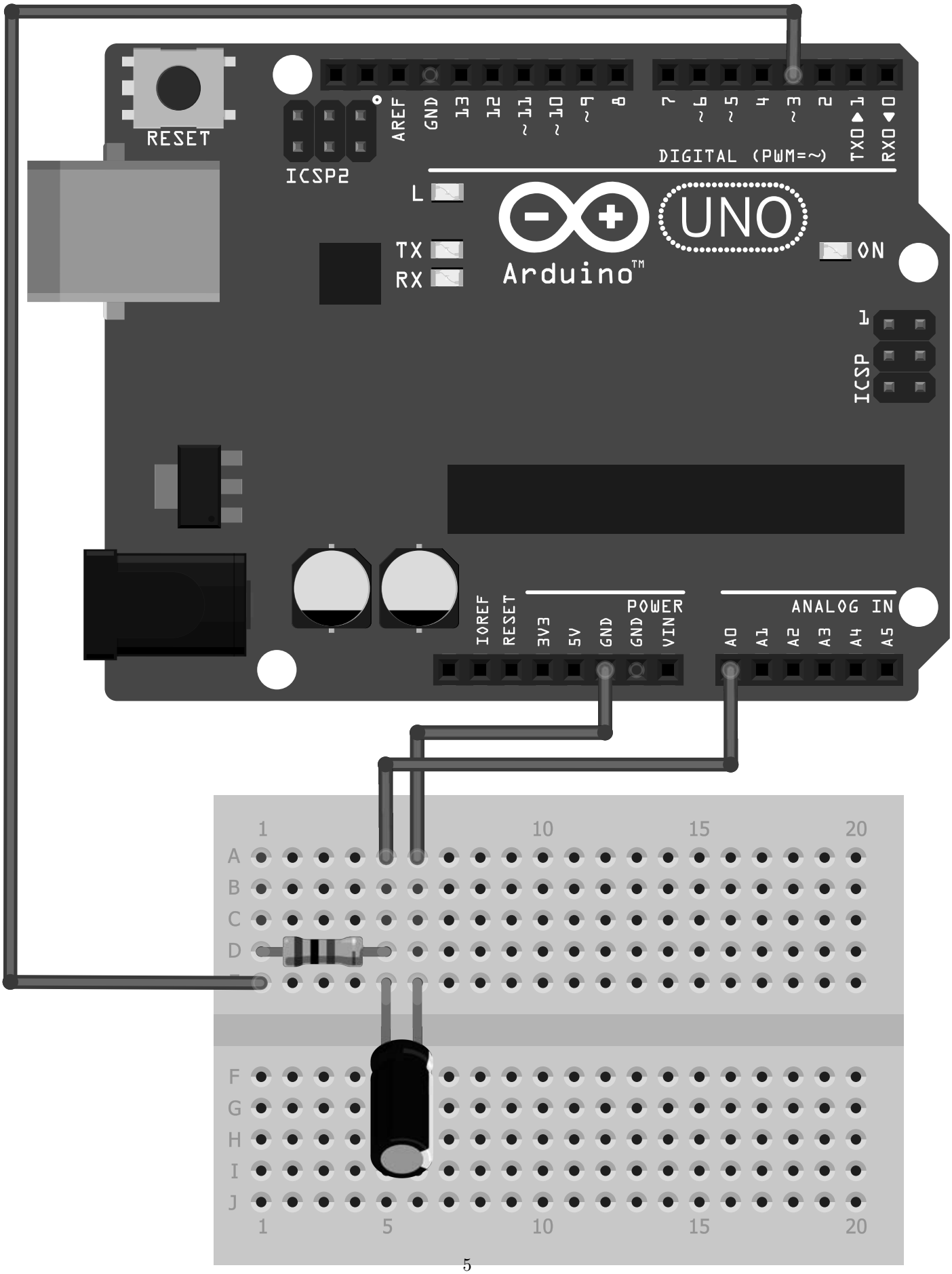


Figure 7: Bridge circuit with a first order RC low pass filter

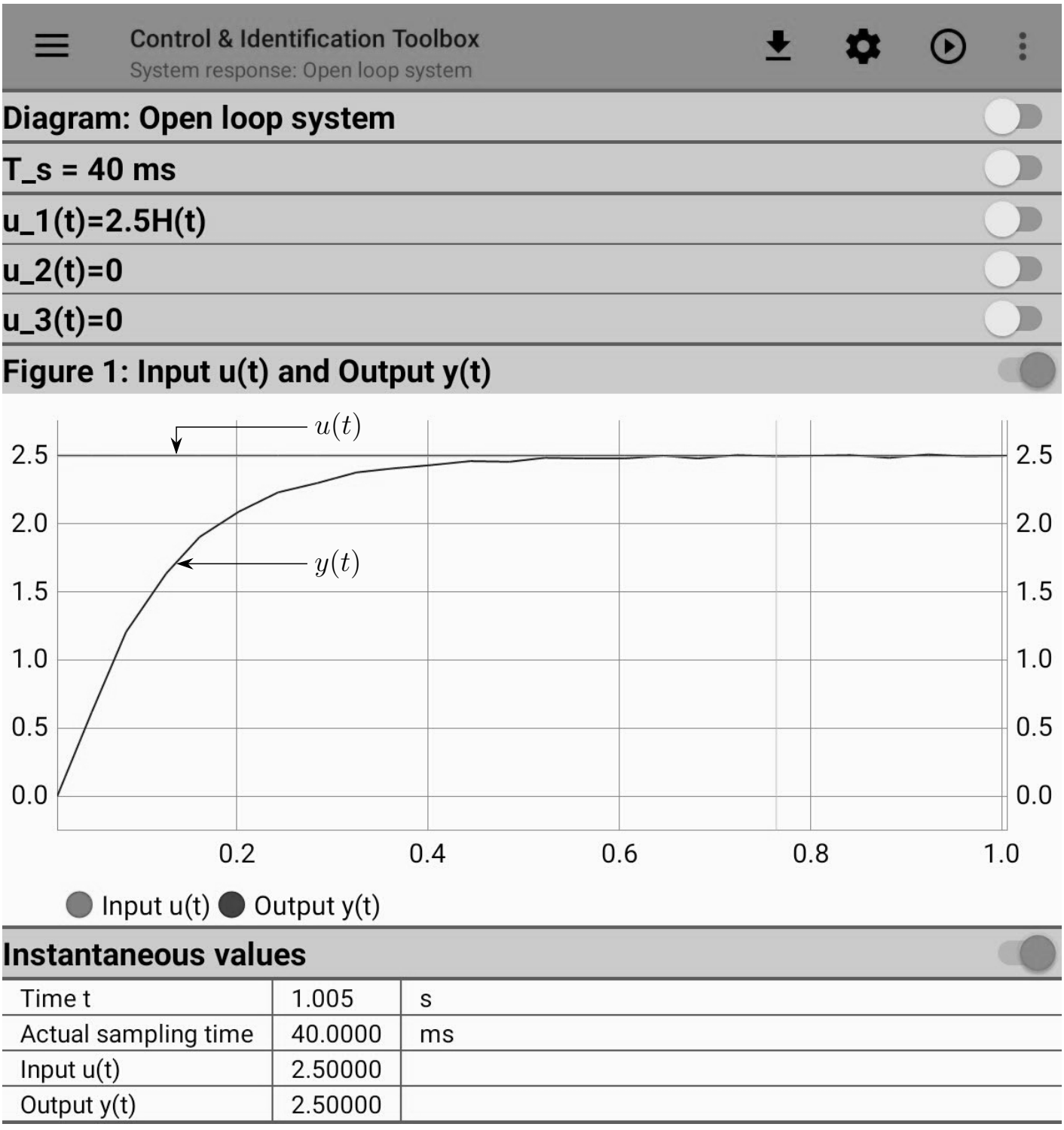


Figure 8: Step response of the first-order low pass filter.

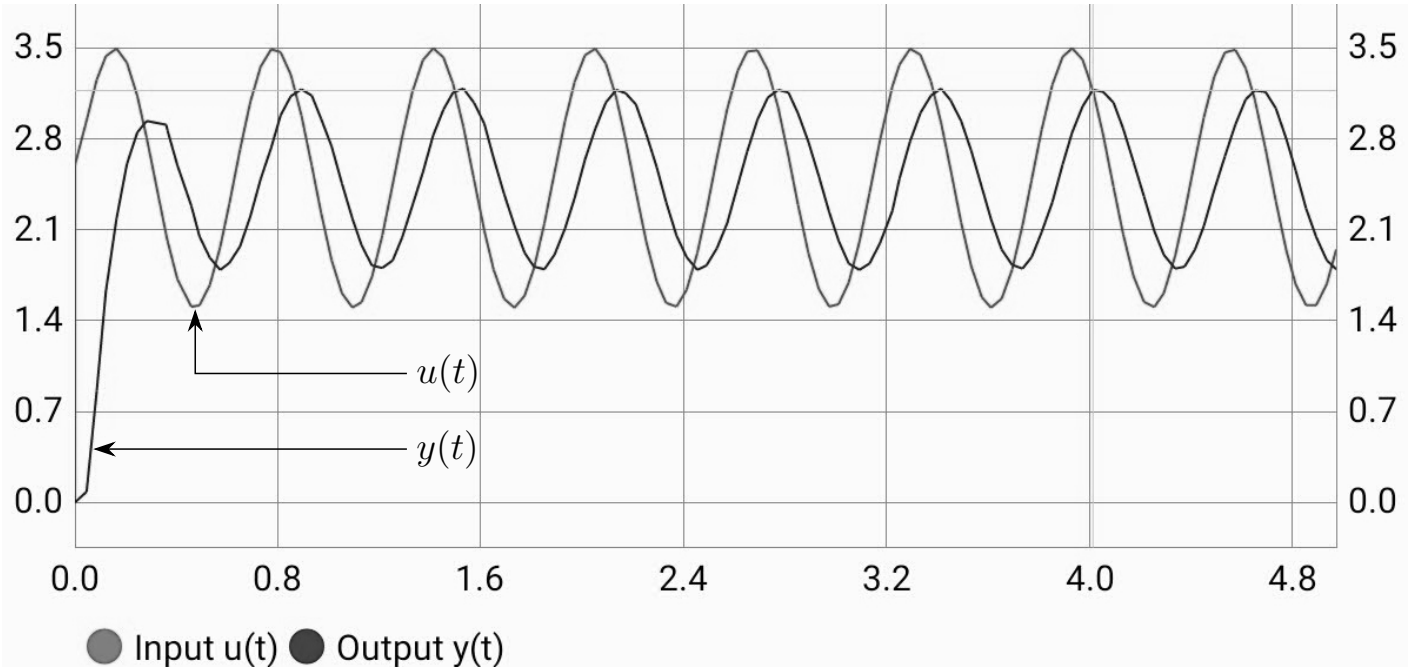


Figure 9: Sinusoidal response of the fist-order low pass filter.

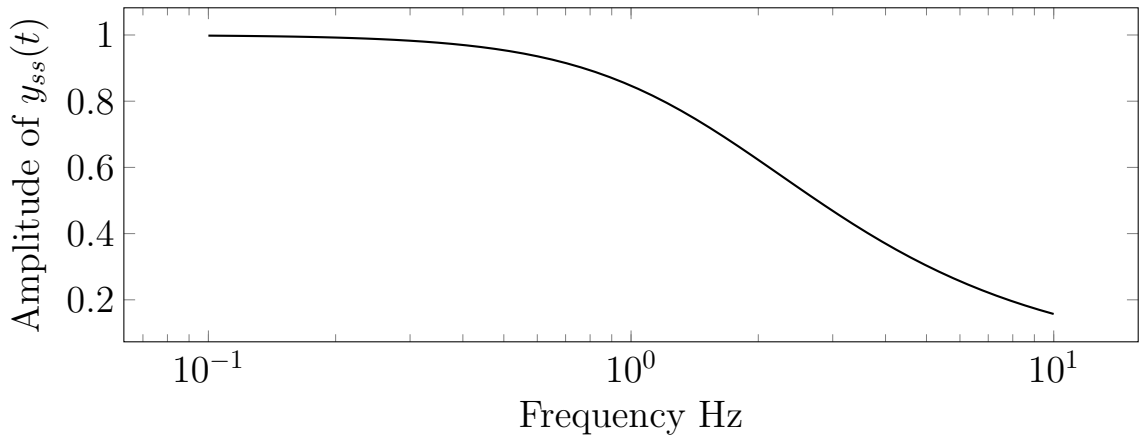


Figure 10: Magnitude of the frequency response of the first-order low pass filter.

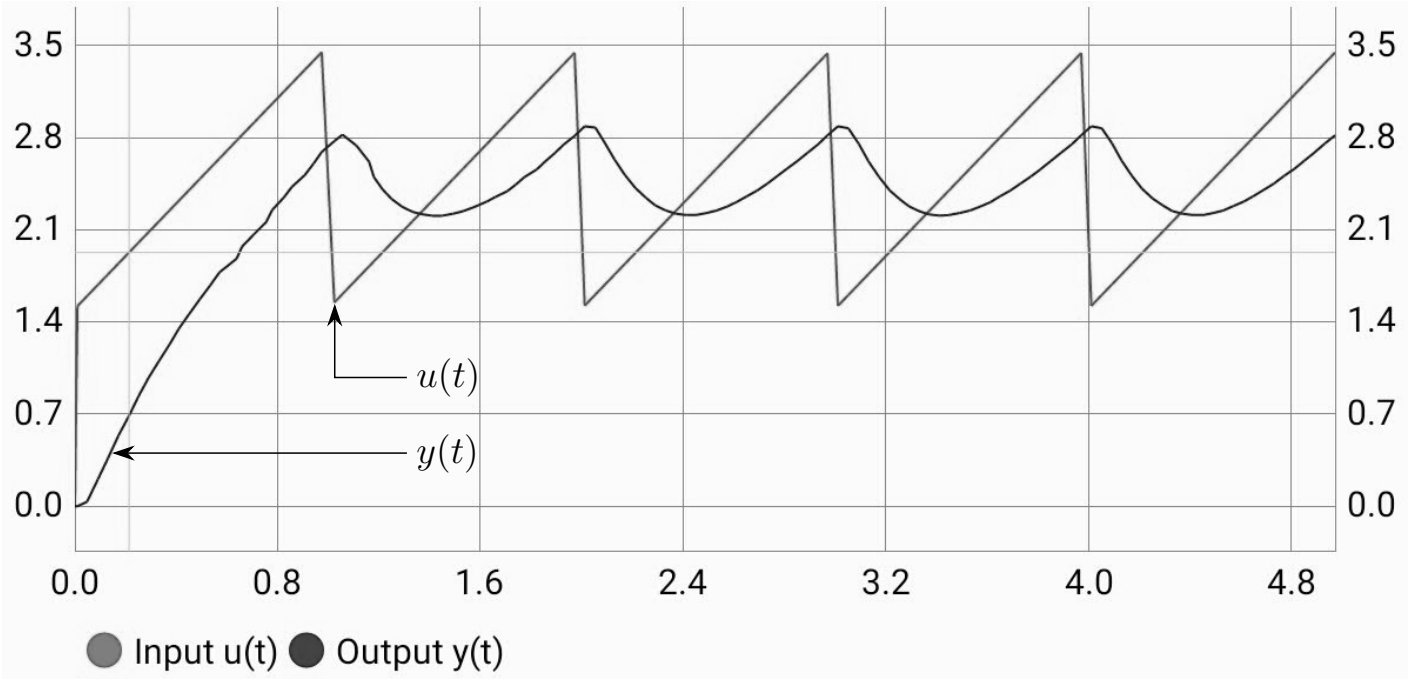


Figure 11: Response of the second-order filter to a sawtooth wave input.

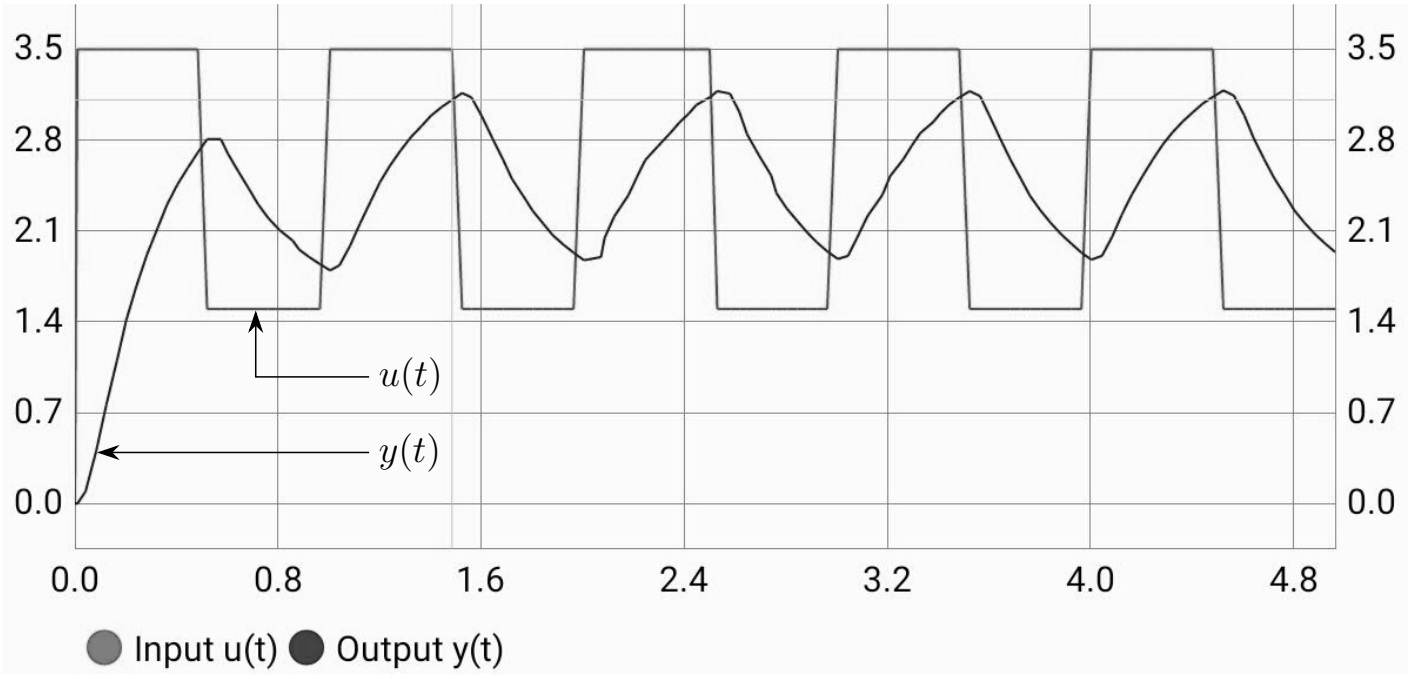


Figure 12: Response of the second-order filter to a square wave input.

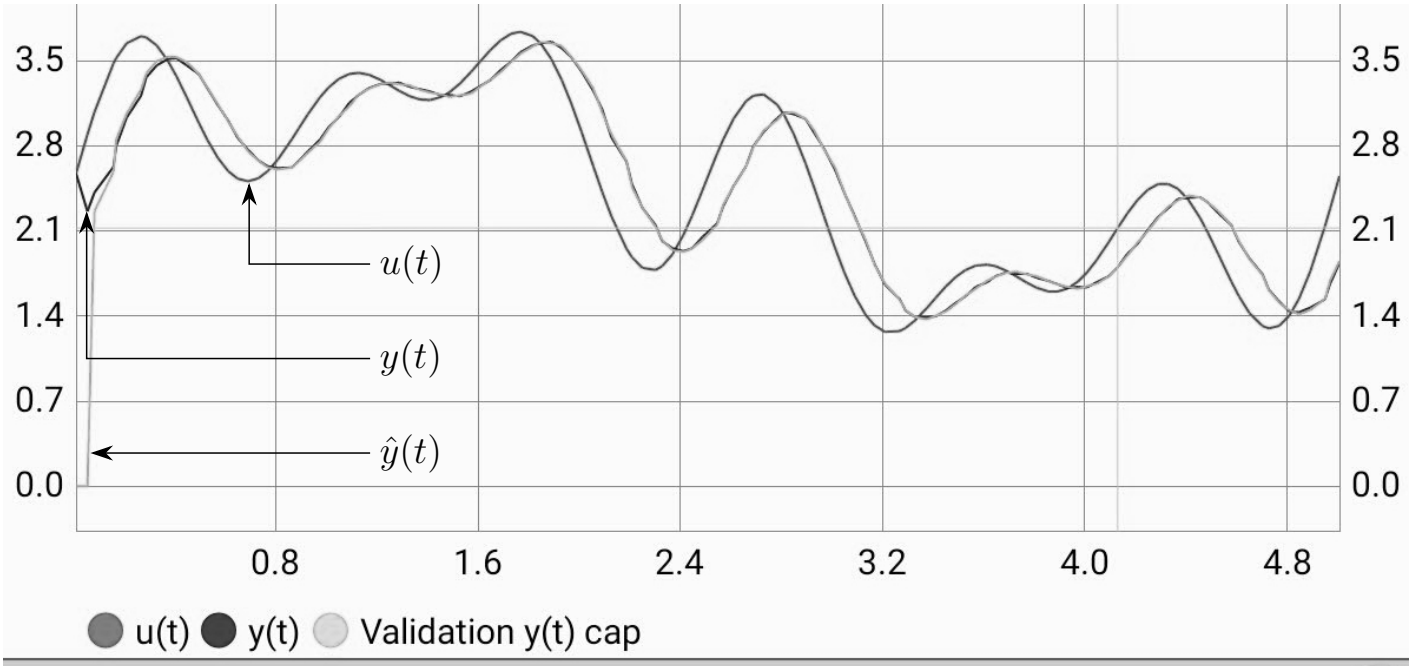


Figure 2: Estimate of θ

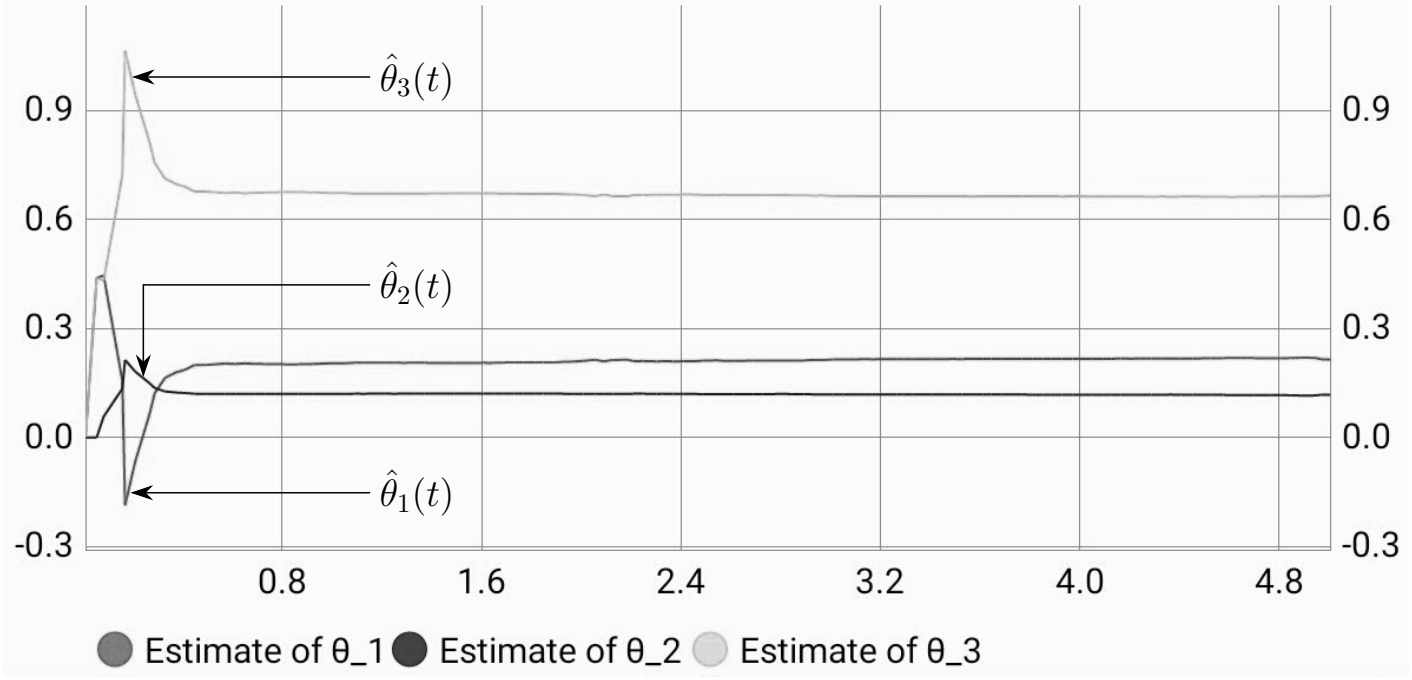
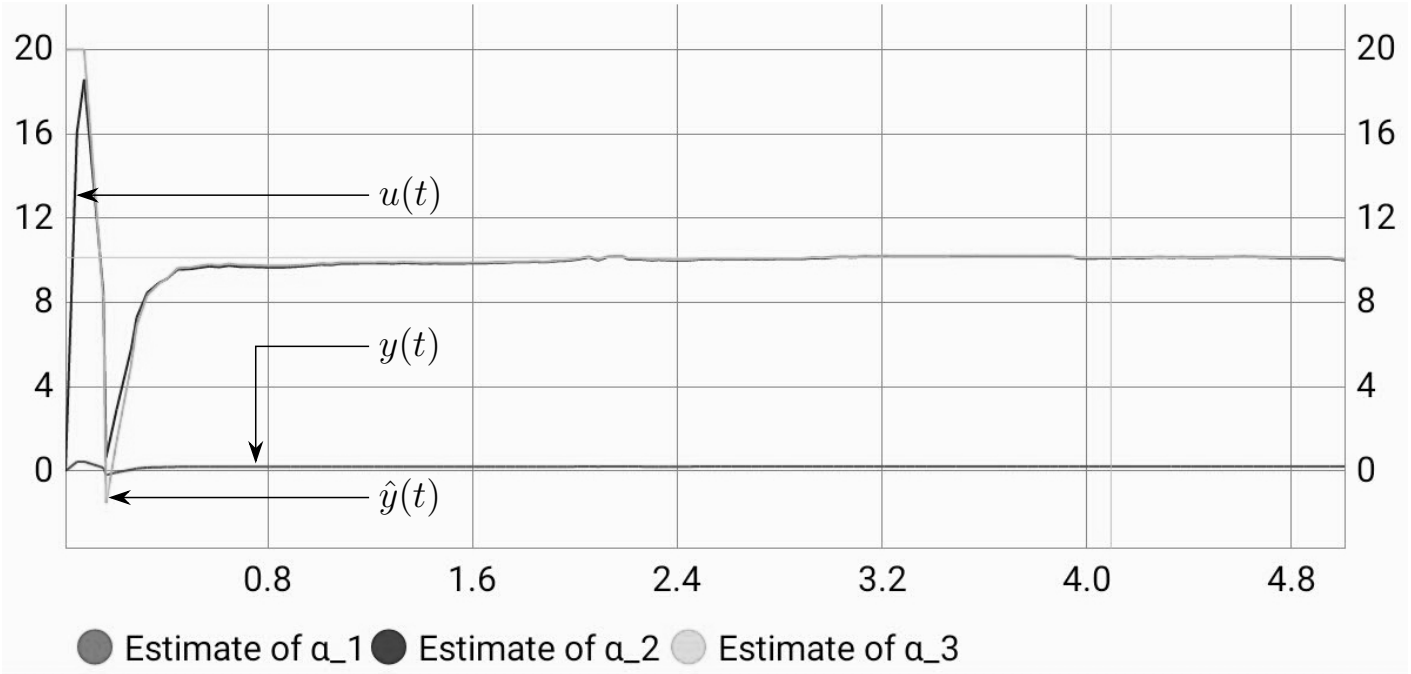


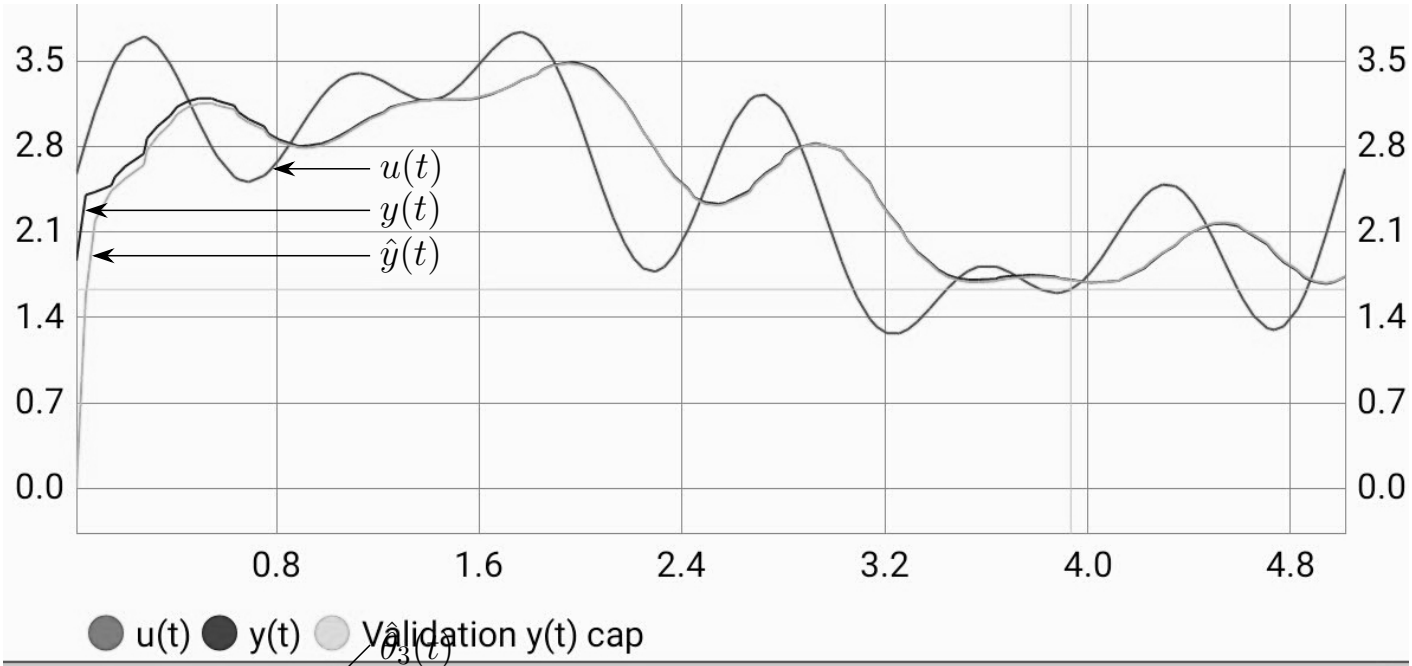
Figure 13: Signals $u(k)$, $y(k)$, $\hat{y}(k)$ and parameters $\hat{\theta}_1$, $\hat{\theta}_2$, $\hat{\theta}_3$.



Instantaneous values

Time t	5.007	s
Actual sampling time	40.4023	ms
u(t)	2.55100	
y(t)	1.83594	
Validation y(t) cap	1.85209	
Estimate of θ_1	0.214658	
Estimate of θ_2	0.117516	
Estimate of θ_3	0.666384	
Estimate of α_1	0.214658	
Estimate of α_2	10.0028	
Estimate of α_3	10.0462	

Figure 14: Estimates $\hat{\alpha}_1(t)$, $\hat{\alpha}_2(t)$, $\hat{\alpha}_3(t)$, .and instantaneous values of signals and parameters.



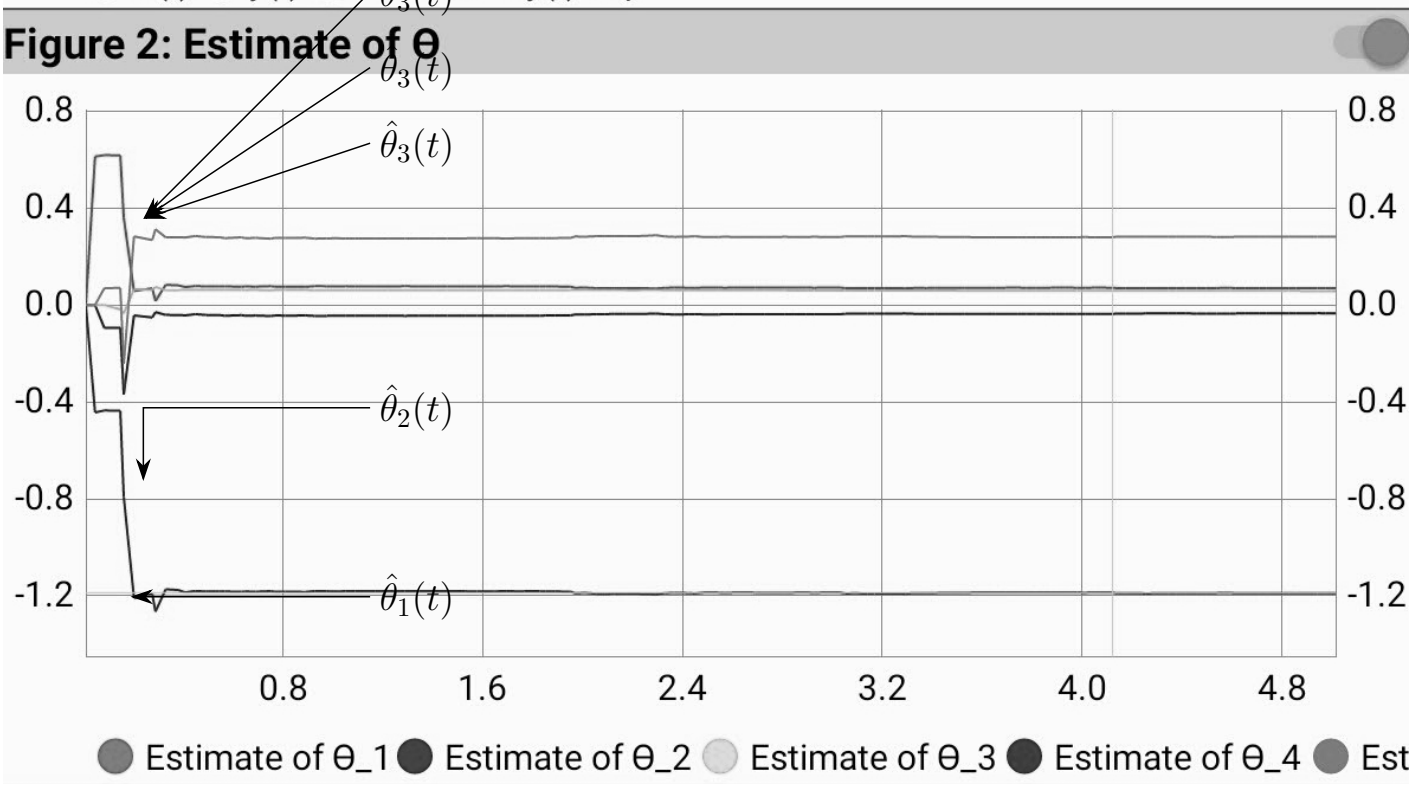
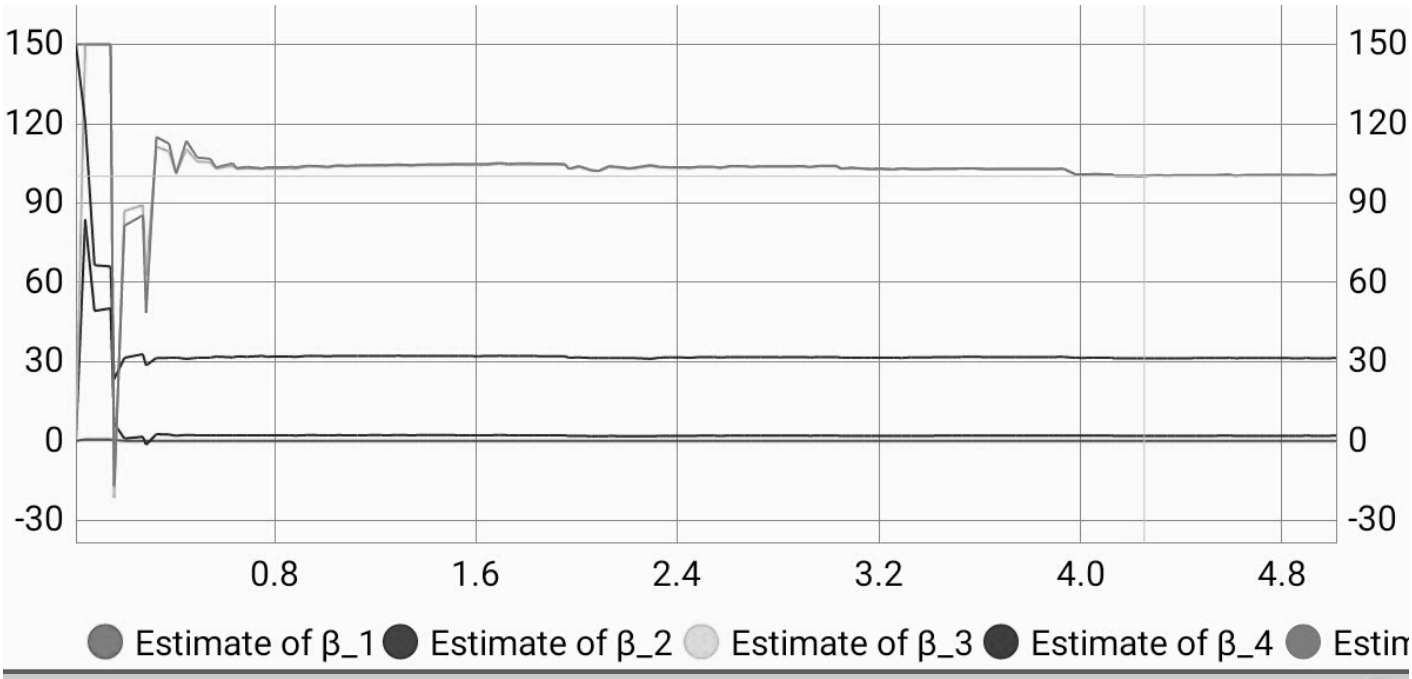


Figure 15: Signals $u(k)$, $y(k)$, $\hat{y}(k)$ and parameters $\hat{\theta}_1$, $\hat{\theta}_2$, $\hat{\theta}_3$, $\hat{\theta}_4$ and $\hat{\theta}_5$.



Instantaneous values

Time t	5.016	s
Actual sampling time	40.4788	ms
u(t)	2.61643	
y(t)	1.73340	
Validation y(t) cap	1.73523	
Estimate of Θ_1	0.0692599	
Estimate of Θ_2	-0.0343029	
Estimate of Θ_3	0.0572122	
Estimate of Θ_4	-1.18859	
Estimate of Θ_5	0.280906	
Estimate of β_1	0.0692599	
Estimate of β_2	2.00433	
Estimate of β_3	100.661	
Estimate of β_4	31.3661	
Estimate of β_5	100.821	

Figure 16: Estimates $\hat{\beta}_1$, $\hat{\beta}_2$, $\hat{\beta}_3$, $\hat{\beta}_4$, $\hat{\beta}_5$, and instantaneous values of signals and parameters.

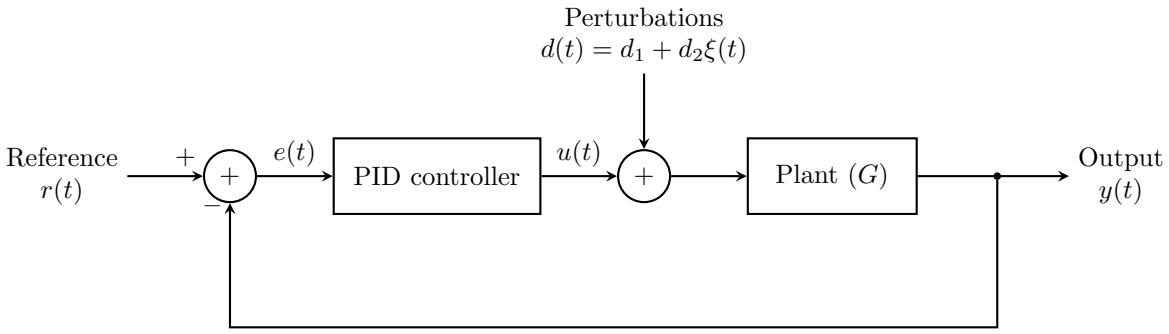


Figure 17: Closed loop system with a PID Controller

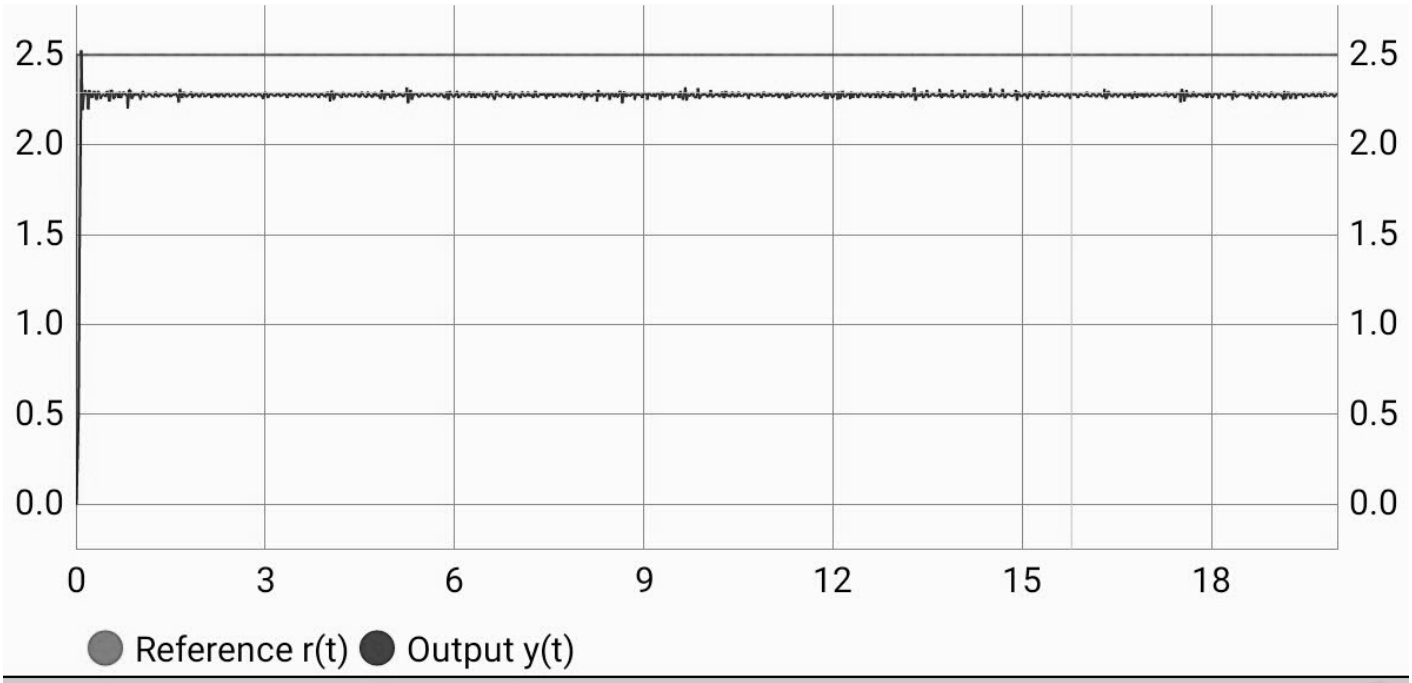


Figure 2: Error e(t) and Control u(t)

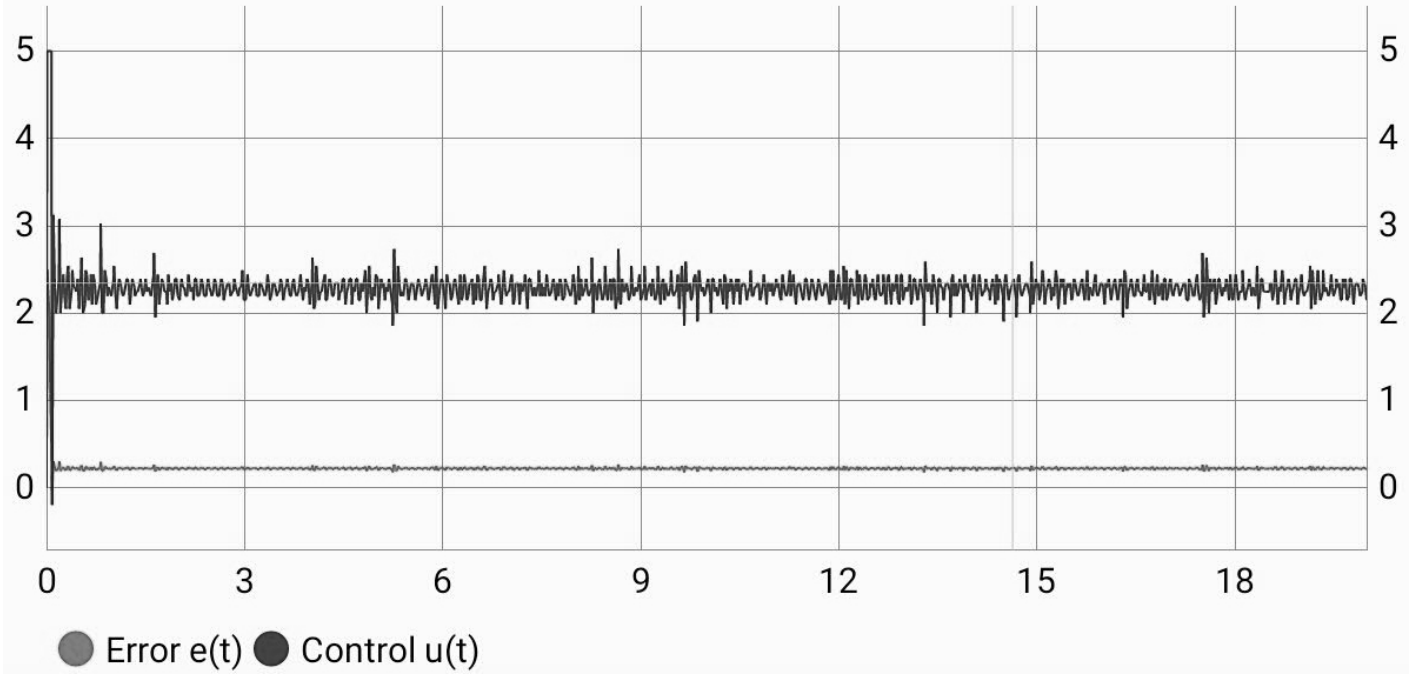


Figure 18: Signals $r(k)$, $y(k)$, $e(k)$ and $u(k)$ of the closed-loop system with $K_P = 10$, $K_I = 0$, and $K_D = 0$.

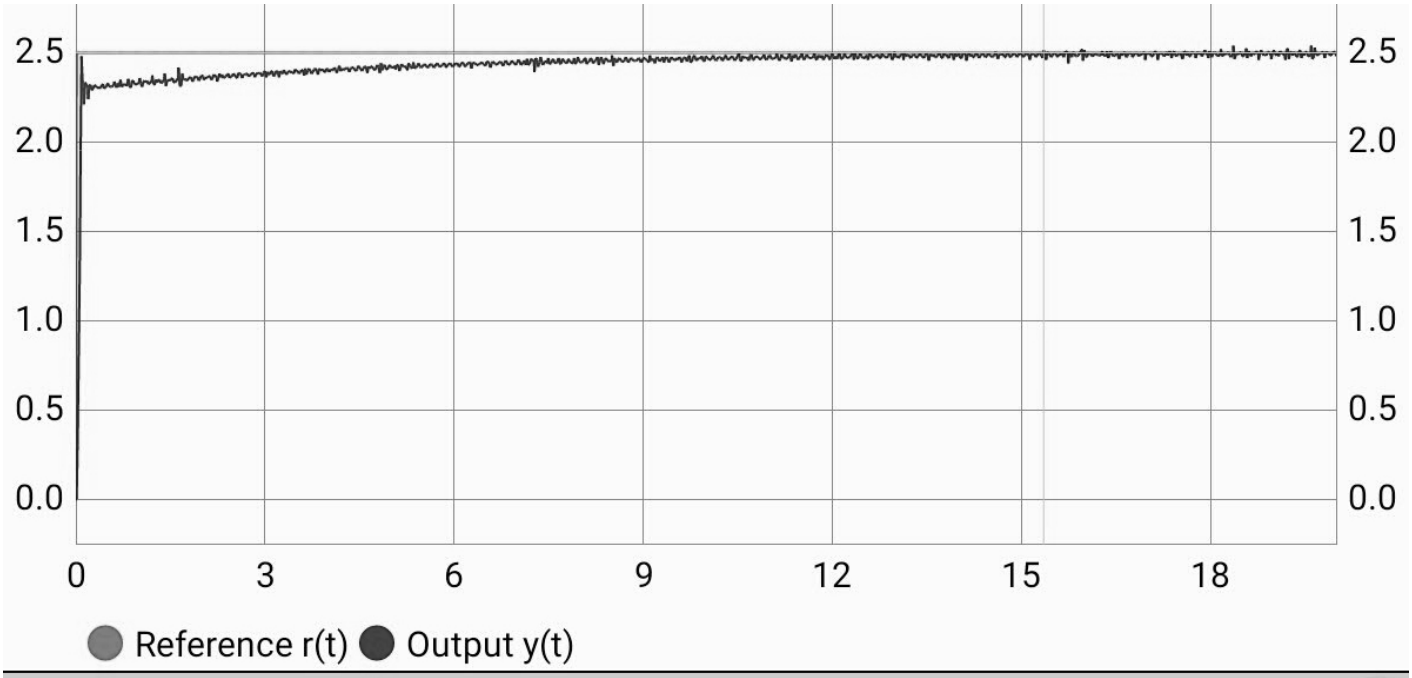


Figure 2: Error e(t) and Control u(t)

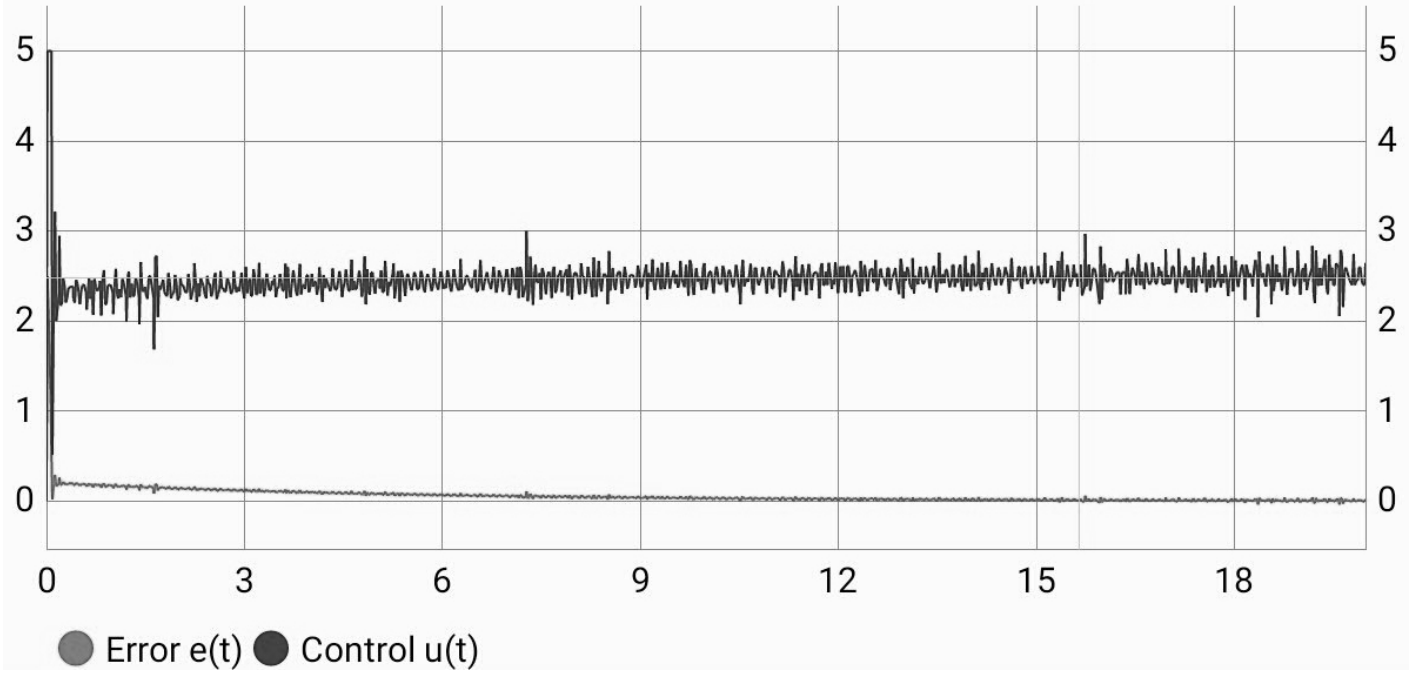


Figure 19: Signals $r(k)$, $y(k)$, $e(k)$ and $u(k)$ of the closed-loop system with $K_P = 10$, $K_I = 2$, and $K_D = 0$.

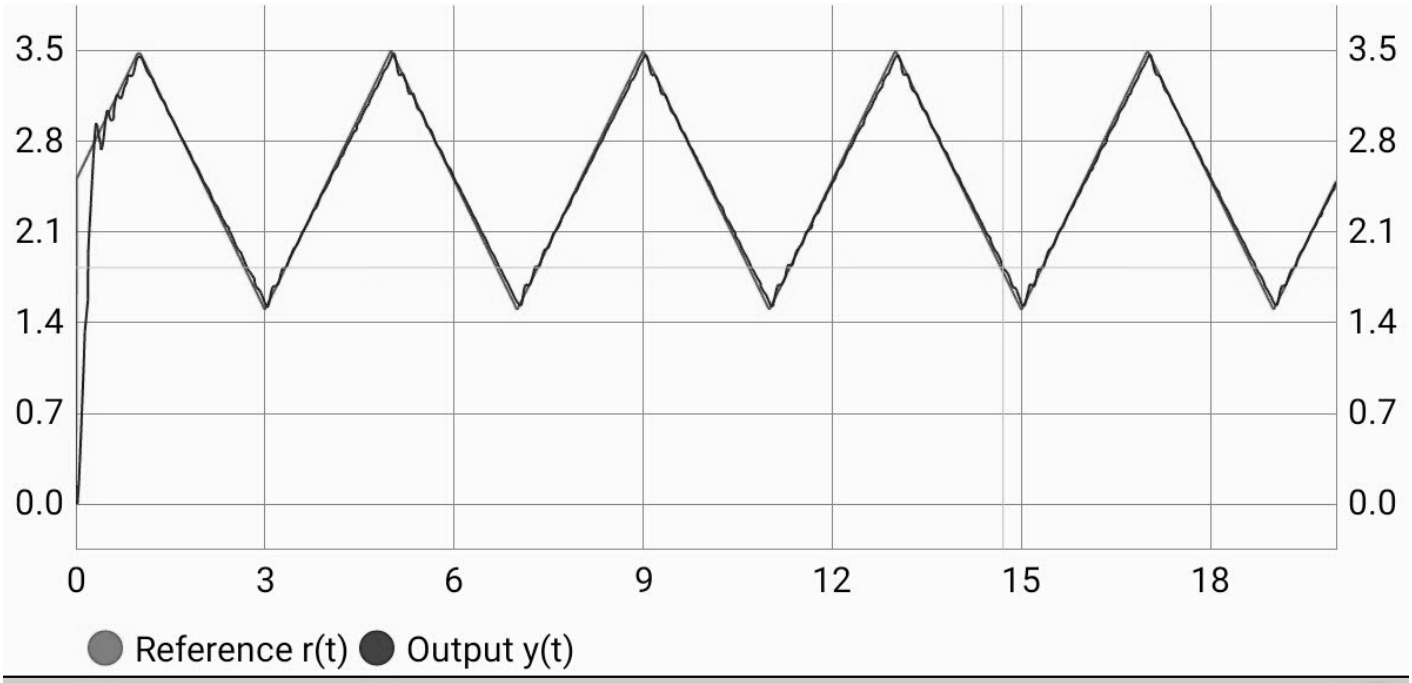


Figure 2: Error e(t) and Control u(t)

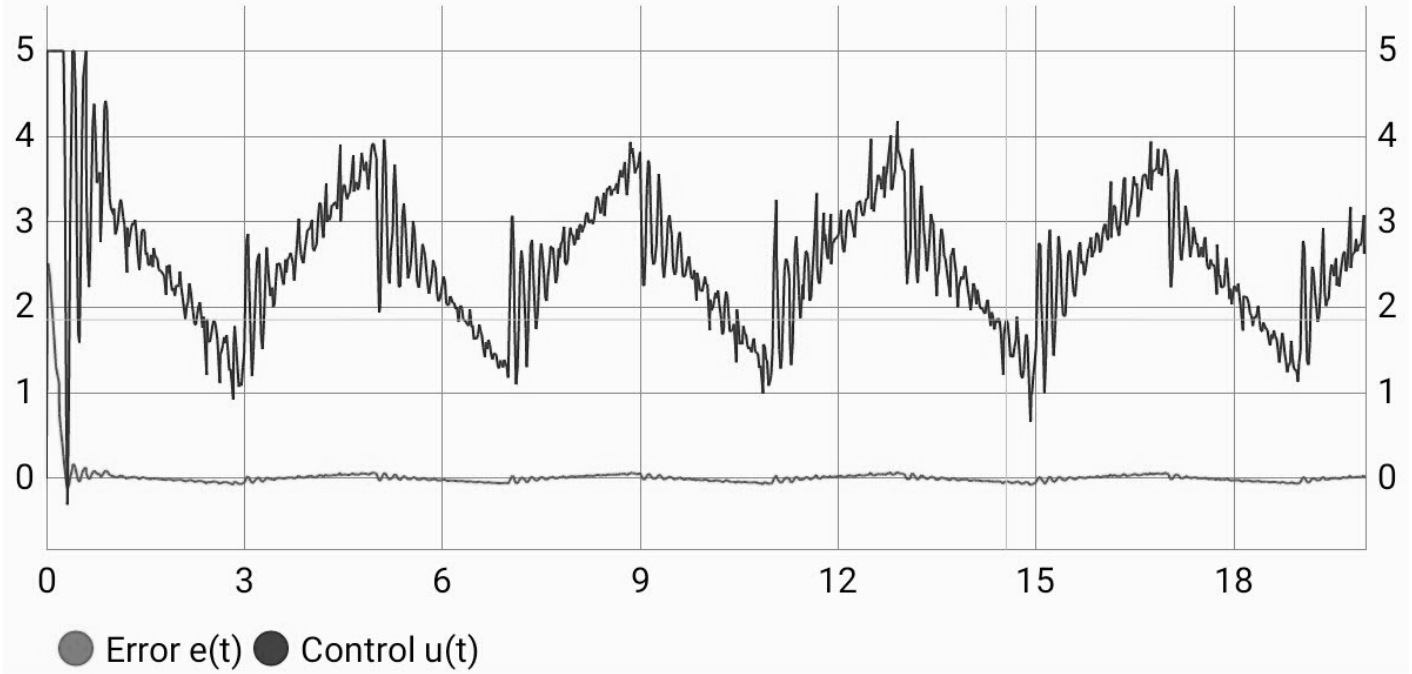


Figure 20: Signals $r(k)$, $y(k)$, $e(k)$ and $u(k)$ of the closed-loop system with $K_P = 20$, $K_I = 5$, and $K_D = 0.1$.