Conclusion

In order to fulfil the postulated task, a tracking system was developed utilising computer vision methods, with a PID controller employed as a control algorithm. Tuning using the Ziegler-Nichols method yielded satisfactory results. However, the transient plots in Figures 6.3-6.4 demonstrated the presence of steady-state oscillations that exceeded the Δ neighbourhood limits set by the specification. Nevertheless, the coefficients were empirically determined based on the data obtained from tuning the PID controller using the aforementioned method. Figure 6.5 illustrates the transient plots of centring the centre of the frame with the centre of mass of the object. The most optimal results in terms of time and error were obtained. The transient time is 4.5 seconds, whereas the problem statement requires a time of less than 10 seconds. A significant time margin was achieved, exceeding twofold. The device is capable of tracking the object in question, provided that the distance between the camera and the object, as well as the object's speed, are known. Furthermore, the detection algorithm demonstrated an object detection accuracy of 95%, which is sufficient in view of the detection error not exceeding 10% according to the problem statement. The necessity for the development of this solution arose in order to enable the video camera to operate autonomously, without the need for an operator. The solution that was ultimately implemented proved to be highly effective in addressing this issue.