0.82 radian) and effects the change over the steering min and max values (-0.22 and 0.25 radian).

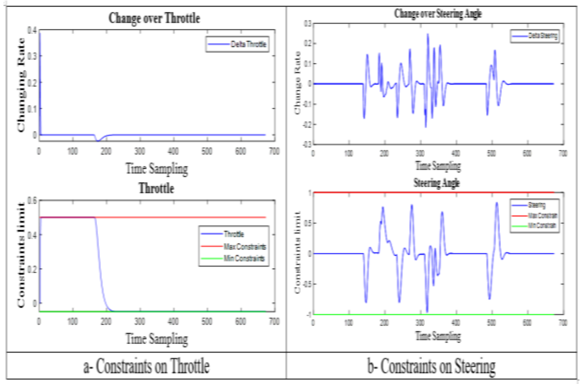

Figure 4. Constraints Applied on the Control Signals Throttle and Steering Angle

Case-3 Apply constraints on both the change on the control signal (*delta_u*) and the control signal (u). Figure 5 shows the combination of both constraints on the change of the control signals and the control signals themselves.

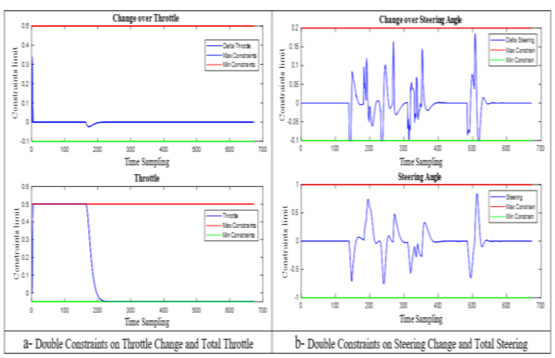

Figure 5. Double Constraints the Control Signals and the Control Signals Change

Therefore, the min and max values of the change on throttle are (-0.023 and 0.33 m/s^2), and the throttle values are (-0.05 and 0.5 m/s^2). The min and max values of the change on steering are (-0.1 and 0.18 radian) and the steering are (-0.76 and 0.82 radian).

5. Conclusion

In this paper, a linear model predictive control strategy was developed for stationary obstacles avoidance of an autonomous driving vehicle in unstructured environment. Simulation results showed the effectiveness of the developed control model in maintaining the vehicle speed and avoiding obstacles encountered by the vehicle. Both non-constraints and constraint scenarios were simulated, and acceptable behaviors of the vehicle were observed in both cases. This approach resulted in an effective prediction strategy by the controller to control the vehicle dynamics using the throttle and steering angle control variables of the vehicle.

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