User Manual
~Emulation system of driver’s own driving

SDL

1. Overview

Fully-autonomous driving is one of the grand challenges in automobile control. One of the most valid policies in autonomous driving is to emulate driver’s own driving. We place particular focus on replaying exactly the same driving as one that the driver did.

One of the methods of evaluating the performance of the autonomous driving is to analyze the driver’s override. However, if once the driver overrode the autonomous driving, the problem how to restart the autonomous driving when the automobile’s position is off the trajectory is caused.

In this work, we aim to develop an experiment environment for evaluating the performance of the autonomous driving. Especially, we develop a system for logging the data of the driver’s own driving and emulating it, avoiding problem mentioned above.

2. Program

In this chapter, we are about to describe the specific contents of program we developed. As mentioned above, we target to log the data of the driver’s own driving and emulate it to develop an experiment environment for evaluating the performance of the autonomous driving. Thus, for the first time, the users have to log the driver’s driving. To record it, the driver needs to drive the course which chosen to carry out experiment and the users record some parameters that are necessary to emulate driving (time, steering wheel angle, throttle operation amount, etc., see Table.1).

Table1. Output parameters

Parameter	Unit	Description
ID	-	-
Time	hh::mm:ss:zzz	Receipt time
DistanveAlongRoad	m	Distance along the road
SteerSw	radian	Steering angle
Throttle	-	Throttle operation amount(0~1)
Brake	Pa	Brake operation amount(~15MPa)
ModeTrans	-	Gear mode

GearTrans	-	Manual gear mode

These parameters are output in one file (csv format). In this program, the parameters we record are tied with the name of road and the distance along the road from start position (road linear distance, see Fig.1). In addition, the start and end of logging can be executed by setting event which is included in UCwin/Road's scenario function.

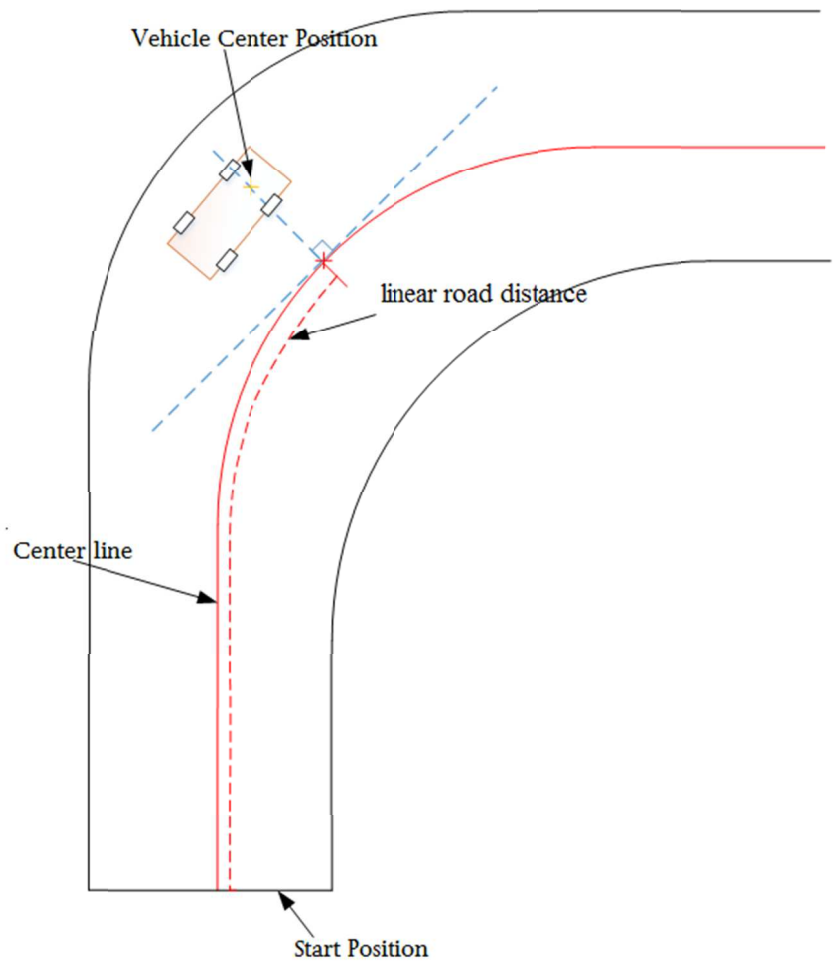

Fig.1 Road Linear Distance

From the log file, parameters mentioned above are sent to UCwin/Road. The road linear distance that is included in this sent data (Past driving data) and current road linear distance are checked, if these two linear road distance are agree with each other, then the linear distance is sent to UCwin/Road. Otherwise, the driving information created from near

point’s parameters by using linear interpolation is sent to UCwin/Road. By above steps, we can conduct autonomous driving that exactly the same driving as one that the driver did and overcome the problem about driver’s override described in the previous section.

今回私達が開発したプログラムの具体的な内容について説明する．前述のとおり，このプログラムは自動運転のパフォーマンスを評価するための実験環境の構築のために，ドライバー自身の運転を記録し，全く同じ運転を再現することを目標としている．そのために，まずドライバー自身の運転を予め記録する必要がある．従って，最初にドライバーが指定されたコースを走行し，時刻，ハンドル舵角，スロットル操作量，ブレーキ踏力，ギアモード(表 1)をログファイル(csv 形式)として出力し，記録する．なお，記録するデータは，道路名と，道路始点を基準とした道路線形に沿った距離(道路線形距離)と紐付けて記録する．また，記録の開始・終了は UCwin/Road のシナリオ設定の中のイベントにより実行することができる．次に，出力したログファイルから前述のデータを UCwin/Road へ送信する．送信されたデータ(過去の運転データ)に含まれる道路線形距離と現在の道路線形距離を照らしあわせ，一致する道路線形距離が存在する場合にはその情報を，一致する道路線形距離が存在しない場合には，近い距離の情報を元に線形補間された運転情報を送る．以上の手順により，ドライバー自身の運転を完全再現し，前章で述べたオーバーライドに関する問題の対策も行った自動運転を実行することができる．