

● ● ● | Music Expression
Synthesis by Driving in the
Tempo-Loudness Space

ISE 575b Final Project
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● ● ● | Motivation

- Tempo-Loudness trajectory is used as a tool to analyze (Langner & Goebel, 2002) and synthesize expression (Dixon, Goebel & Widmer, 2002)
- ESP: driving interface to synthesize expression (Chew, François, Liu & Yang, 2004)
- Driving in Tempo-Loudness Space?

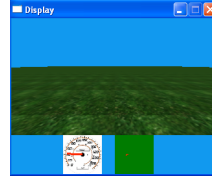
● ● ● | Design

- Tempo Loudness Space
 - Tempo: 0-150bpm
 - Loudness 0-127
- Car's model from ESP
- MFSM



● ● ● | Observations

- Free Driving?
- No road, No guidance?
- Driving vs. Racing?
- "Right" Expression?



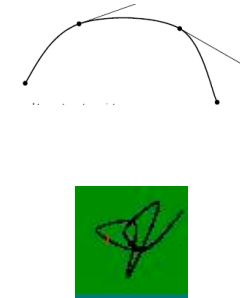
Guidance: Control Points

- A deadpan MIDI is played by ESP to make it expressive
- Select several points in Tempo-Loudness space

```
0.30 60 0.0
0.504531 109 0.050062
0.416899 127 0.100044
0.378227 116 0.134964
0.577840 96 0.232025
0.406071 74 0.245971
0.480436 127 0.314015
0.553955 50 0.365476
0.602669 91 0.437210
0.586833 98 0.471382
0.658382 114 0.507399
0.522689 66 0.524668
0.417611 127 0.668772
0.292253 104 0.731994
0.354883 127 0.850003
0.459928 69 0.911444
0.077102 127 1.0000
```

Make a road?

- Cubic Hermite Spline
- Endpoints and tangents
- Sequentially connect the points
- Smoothness

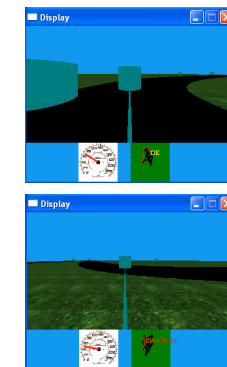


Two Time intervals

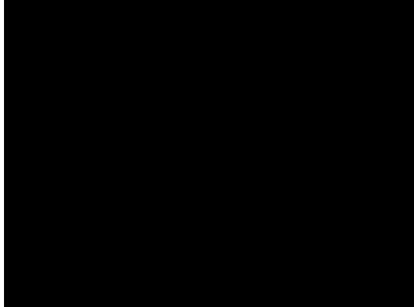
- Physical distance
 - From the car's position and the coming control point's position d_1
 - $T_1 = d_1 / \text{car's velocity}$
- Music distance
 - The control point's music position and the current music position d_2
 - $T_2 = d_2 / \text{car's horizontal coordinate (tempo)}$

Suggestions

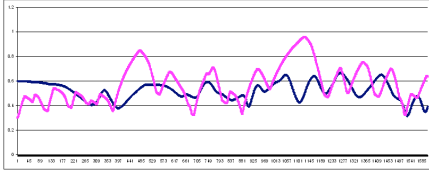

- The user does not have to always follow the road
- Compare the two time intervals
- Force the car to stop when hitting the cylinder
- Bumper car



● ● ● | Demo



● ● ● | Results

● ● ● | Discussion

- A tool to synthesize expression (no articulation)
- Road vs. performance trajectory
- Size of the space