Transportation in the Future

November 23, 2012

Then and Now ...

Road

- Ford T (1908): IC Engine; 65-72 km/h

Miura

- Lamborghini Miura (1968): IC Engine; 275 km/h

Road

- Bugatti Veyron (2005): IC Engine; 430 km/h

Rail

- Mallard (1938): Steam; 160 km/h

Rail

- Shinkasen (1967): Electric; 220 km/h

Rail

- Shinkasen (2011): Electric; 300 km/h

... and Ahead ...

Driverless Cars

- Accidents are the leading cause of deaths
- Commuting time leads to loss of productivity

Driverless Cars Timeline

- First DARPA Challenge: 2004
- 2005: Won by Stanford's Stanley
- 2007: Urban Challenge – CMU's Tartan Team
- Today: Google's Driverless Cars
- 2012: Road legal in California and Nevada

Technology

- GPS – static positioning
- Radar – obstacles
- Cameras – read and process road signs

Videos

- DARPA: http://www.youtube.com/watch?v=LZ3bbHTsOL4
- Google: http://www.youtube.com/watch?v=J17Qgc4a8xY

Benefits

- No fatigue
- Self-parking
- Reduce lane widths

Ultra High Speed Trains

- Main limiting factor in speed is friction
- Sources: air resistance and rolling resistance
- Vacuum tunnels and magnetic levitation (MagLev)

Speed and Energy

- Speed could be in excess of 5000 km/h
- Sound barrier, but no sonic boom
- Energy only used for acceleration and retardation

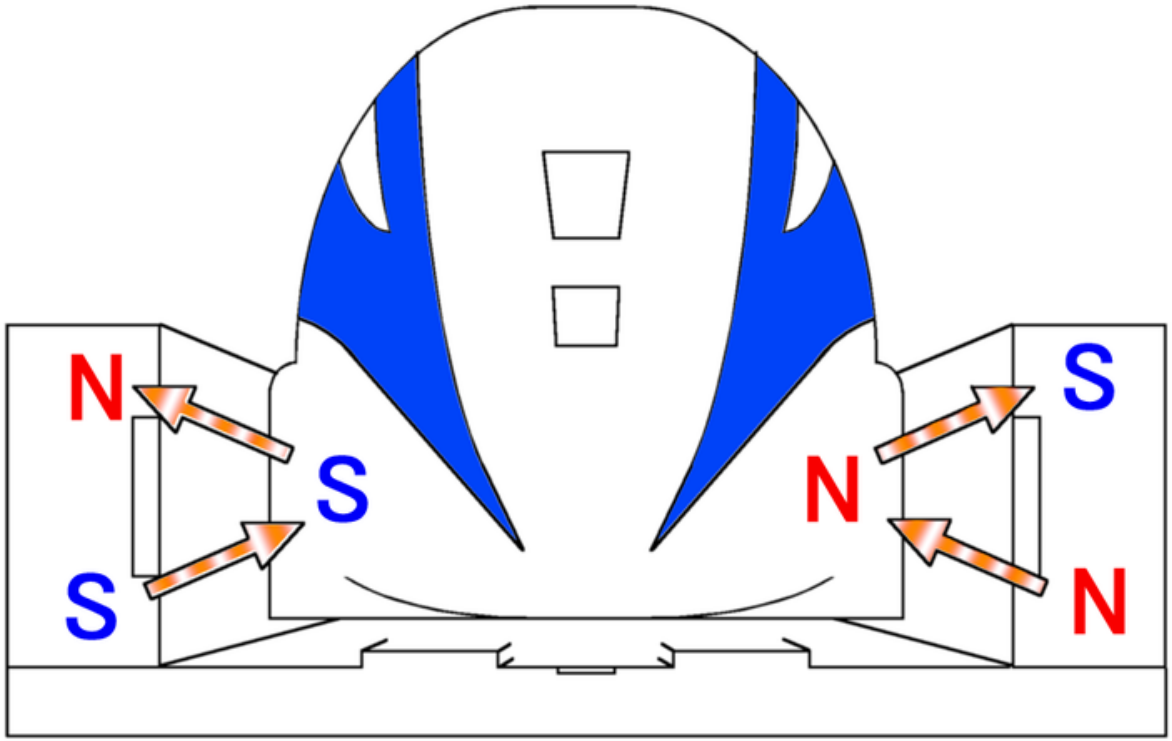
MagLev Trains

- Two in operation: Shanghai (China) and Mizayaki (Japan)
- Can be electromagnetic or electrodynamic

Electromagnetic Suspension (EMS)

- Underside of train has large C-shaped electromagnets
- Repelled by the steel underside of the track
- Levitates by around an inch

Electrodynamic Suspension (EDS)



- Magnets on both the train and the track underside
- Levitates around 4 inches

EMS vs EDS

- EMS systems require less magnetic fields
- EMS are less stable and need constant monitoring
- EMS also function at low speeds
- EDS are more stable due to presence of multiple magnets
- Need to be shielded, else would affect pacemakers

Vacuum Tubes

- Air resistance prevents MagLev's from going faster than 600 km/h
- Vaccum tubes: large, hollow tubes that MagLevs can travel in
- Partially evaluated tunnels are useful to

Problems with Vacuum Tubes

- Expensive to build
- Maintaining a vacuum is expensive; proposals have suggested a global, interconnected network of tubes
- Depressurizing chambers on either end to allow vehicles to gently normalize pressure
- Single points of failure and attractive terrorist attack sites

What about Space?

- Even more desperately in need of an overhaul
- Space elevators and Loftstrom loops are possible future plans
- Too lazy to talk about them today

Conclusion

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- Well it's almost here

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Conclusion

- The future is here
- Well it's almost here
- Actually, it's almost almost here
- Translink *doesn't* represent the future
- Leave early to make it to beer call in time!