

Automation of Buses

A Glance at the Future of Transportation

What Are Autonomous Buses?

- ▶ Electrically-powered
- ▶ Self-driving
- ▶ Transports twelve or more passengers
- ▶ Utilizes cameras, sensors and remote controls to steer



Benefits of Autonomous Buses

- ▶ Lowered cost for drivers and operations.
- ▶ Road risks minimized due to technological prediction and response.
- ▶ Greenhouse gas emission could see significant decrease.
- ▶ Reduced carbon footprint.
- ▶ Encourage increased ridership, leading to less-congested roads.
- ▶ Alleviate amount of truck and bus-related crashes that occur due to human error, which caused \$87 billion worth of damages in 2013. (Source: DOT)

Current Usage of Autonomous Buses

Worldwide

- ▶ China:
 - ▶ Began public testing in 2015.
 - ▶ Maintains operator in case of emergency.
 - ▶ Equipped with numerous sensors to guide vehicles through busy cities.
- ▶ London:
 - ▶ Tested a 11.5m autonomous bus in 2019.
 - ▶ Demonstrated ability to respond to surroundings and hazards, including cyclists.
 - ▶ Plans to introduce multiple 15-mile routes utilizing this new technology next year.

United States

- ▶ Orlando:
 - ▶ Implemented smaller, autonomous shuttles for downtown traffic.
 - ▶ Operates at a maximum speed of 15mph.
 - ▶ Holds up to 10 passengers.
- ▶ Las Vegas:
 - ▶ Employs free autonomous shuttles in Downtown Las Vegas and in Fremont area.
 - ▶ Retains operator for emergency situations.

Example of Autonomous Bus - China



Future of Autonomous Buses

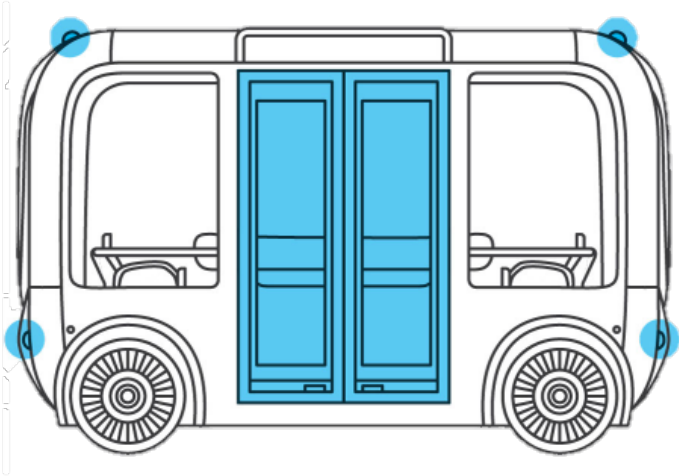
- ▶ Worldwide revenue from autonomous trucks and buses reached \$84 million in 2017.
- ▶ Market will develop at a strong pace over next few years with competition within the industry.
- ▶ Anticipated to reach global revenue of \$35 billion by the end of 2022.
- ▶ Algorithms are in continued development to become increasingly responsive to human behavior and various road obstacles.

Olli Shuttles

- ▶ 360 degree sensors with LiDAR technology (Light Detection and Ranging) and radar.
- ▶ Remote vehicle monitoring.
- ▶ Transport up to 8 passengers.
- ▶ Travel up to 25 miles per hour.
- ▶ Equipped with IBM's Watson Internet of Things Platform, enabling it to answer questions riders have and assist in locating places for them.



Safety is in the Details



- ▶ Sensors are not affected by lighting, dust, or fog.
- ▶ System checks automatically for safety in all modes and is continuously collected and monitored.
- ▶ Obstacle avoidance technology ensures the path is clear of obstructions and can automatically reroute.

What Makes Olli Unique

- ▶ 3D printing of Olli vehicles allows for direct production by parent company Local Motors.
- ▶ Fully electric vehicle.
- ▶ Local Motors works with the general public to increase accessibility for riders with varying mobility with project #AccessibleOlli.
- ▶ Modally app allows riders to schedule their stop and book a ride with Olli from anywhere.
- ▶ Olli's smart software plans the most efficient and direct route to any stop, even when experiencing a detour.
- ▶ Fully customizable for each agency.

Transit Automation Research Funding Opportunities

- ▶ USDOT made up to \$60 million in federal funding available for grants in 2018.
- ▶ FTA made \$500,000 in Section 5312 funds available for agencies to begin research in 2019.
- ▶ FTA's Integrated Mobility Innovation Program provided up to \$15 million for demonstration projects to agencies in 2019.