Vision

A team of employees from the Centers for Disease Control hop on a shared autonomous vehicle (SAV) to grab lunch in downtown Chamblee to celebrate a birthday. A teen summons an on demand SAV to play ball at Keswick Park, instead of being shuttled by parents. A resident from downtown Atlanta hops off the train and takes an SAV to work at Third Rail Studios.
Project Overview

• How can we design the user experience to ensure this project is more than a novelty? It should be a true mobility solution.

• What utilitarian decisions need to be made to be a leader in this technology and pilot an AV shuttle in Chamblee?
Project Team

- Chamblee – Rebecca Keefer, Andrew Russell, Matt Dickison
- GA Tech Research Team – Ellen Dunham-Jones, Zach Lancaster
- Smart Community Corps – Rey Angeles
- Assembly CID – Eric Pinckney, Matt Samuelson
- Stantec – Craig Lewis, Michelle Orfield, Joel Mann
- Doraville – Luke Howe
Project Deliverables

• Operations Plan
  • Detailed route planning, scheduling, logistics, and cost estimates to prepare the City for selection of operator for deployment.

• Best Practices Manual
  • Anticipate a series of design guidelines for local governments to explore and eventually serve as a turnkey solution for autonomous vehicles and shuttles in a community; and
  • Report to other local governments wishing to follow our path, as well as identify any regulatory barriers toward local government implementation at the local, state, and federal levels.
Project Motivations and Goals

- Smart Mobility
- Leader/trail blazer
- Sound land use/transportation policies
- Economic development
- Project funding
Initial Investments

- Feasibility Study:
  - Description of technology
  - Chamblee analysis
  - Cost estimates
  - Route alternatives
  - Recommendations
  - Next steps

- Peachtree Road Streetscape and Rail Trail Plan:
  - Road diet
  - Safety and operational improvements
<table>
<thead>
<tr>
<th>Comparative Analysis</th>
<th>City Civic Complex</th>
<th>PDK Airport</th>
<th>Peachtree Station</th>
<th>Chamblee Plaza</th>
<th>Keswick Park</th>
<th>Third Rail/Assembly</th>
<th>CDC/IRS</th>
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<tr>
<td>Number of job along route</td>
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<td>★★</td>
<td>✔️</td>
<td>✔️</td>
<td>-=-</td>
</tr>
<tr>
<td>Increase in transit service coverage</td>
<td>-=-</td>
<td>-=-</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>-=-</td>
</tr>
</tbody>
</table>
Manufacturers and Self-Driving Shuttles in the process of testing and launching pilot programs.

**Easy Mile**
- EZ10
- 25 mph top speed
- 8-16 people maximum capacity
- 16'x7'x9' typical size

**Local Motors**
- Olli
- 3-10 hours amount of time on a single battery charge

**Navya**
- Arma

**Self-Driving Shuttle and Standard Bus Comparison**
- 16'x7'x9'
- 16 feet
- 40 feet

**Shuttle Details**

**Notable Features:**
- Tight enough of a turning radius (13-15 feet) to drive on existing streets
- Operates in both directions, eliminates the need to turn around
- Works with a mobile app for on demand calls and real time monitoring
- Wheelchair accessible and working to offer more accessibility features and compliance with Americans with Disabilities Act (ADA) regulations
- Redundant breaking mechanisms
- Emergency stop button on-board
- Direct telecom connection to central command hub for passengers
SAV ROUTE
Schedule

KICKOFF

PUBLIC INVOLVEMENT

OPERATIONS PLAN

BEST PRACTICES MANUAL

DEPLOYMENT

SEP/OCT  NOV/DEC  JAN/FEB  MAR/APR  MAY/JUN  JUL/AUG  SEP/OCT

Kickoff Workshop

Research Webinar

Site Visit

Workshop #2

Operations Plan Adoption

Data Mgmt. Presentation

Workshop #3

Best Practices Adoption
Public Involvement
Funding

- Smart Communities Grant: 50%
- Cash Match: 48%
- In-Kind Match: 2%
Operations Plan

- Project description and schedule
- Charging/Storage/Maintenance plan
- Routing and signage/signalization criteria
- Technology provider(s) and operations team and responsibilities
- Use case scenarios
- Testing and evaluation plan
- Funding and procurement of system/services
- Risk assessment and mitigation strategies
- Emergency response plan
- Licensing requirements
- Cost estimates
Mercy Care
MARTA (Chamblee)
Chamblee-Dunwoody
Broad
Third Rail (Optional Extension)
Assembly Yards (Optional Extension)
Peachtree Station - Assembly
Length = 2.2 miles

10 hour service day / 7 days / week

Single SAV (no spare) = 15-minute headway
Deployment Costs

**Infrastructure Improvements**
$75,000 - $100,000
- Connected infrastructure
- Flashing beacon stop signs
- Benches
- Sidewalk connectivity
- Lane painting / signage

**Capital Expenditures**
$10,000 - $35,000 (monthly lease)
$250,000 - $425,000 (own)
- Vehicle
- Start up training & programming

**Annual Operating Costs**
$250,000 - $350,000
- Software licensing
- Insurance
- Maintenance
- Onboard attendant
- Program management
Could Self-Driving Shuttles be Coming to Chamblee?

POSTED: AUGUST 7, 2018

Imagine tapping an app on your phone and within a few minutes, a car shows up to take you wherever you want to go at an affordable price.

But wait, you’re already on that.

Now imagine that the vehicle pulling up to your curb is self-driving. The City of Chamblee, along with several partners, is preparing for just that.

Chamblee is one of four cities across Georgia to win a grant from Georgia Tech’s Smart Communities Challenge. Chamblee will study how shared, autonomous vehicles — aka self-driving cars — and other automation and connected technologies may shape the future of the North Dekalb County City.
Chamblee, US is preparing

Policy and Planning Priorities:

In 2017, Chamblee, Ga. (pop: 39,000) began exploring the possibility of a shared autonomous vehicle pilot to provide bus-like, on-demand rides. The pilot’s $4.4 million study is being conducted by a team of experts from Georgia Tech and is expected to take place in collaboration with MARTA’s current shuttle service. The study aims to assess the feasibility of using autonomous vehicles for public transportation and to gather data on public opinion and potential usage.

Chamblee is one of two cities in Georgia to receive a grant from the Georgia Tech/Smart Communities Challenge. Chamblee will study how shared, autonomous vehicles – in addition to traditional public transit – can be integrated into the city’s transportation network to improve accessibility, reduce traffic congestion, and promote sustainable mobility. The study will also consider factors such as public safety, infrastructure needs, and the economic impact of autonomous vehicle technology on the local economy.
Chamblee, US is preparing

Policy and Planning Priorities:
Land Use and Transit Planning, Pilot Zone Identification

In 2017, Chamblee, Ga. (pop: 18,000), began exploring the possibility of a shared autonomous vehicle pilot to provide door-to-door service to residents. The $4,000,000 study was conducted by Urban Studio, a planning firm, and involves several AV projects throughout the city’s MARTA rail station. A draft of the completed feasibility study, which involved community group discussions and an online survey was adopted by city council in March 2018, and presents a number of possible shuttles routes serving the city’s main thoroughfare of Peachtree Road, including employers such as the Centers for Disease Control, Internal Revenue Service, and the Peachtree-Dekalb Airport. Key findings include an estimated operating cost of $12,000 to $14,000 per month per vehicle, with 70 percent less than conventional human-driven, full-size buses on the same routes.
Initiative on Cities and Autonomous Vehicles

Chamblee, US is preparing

Policy and Planning Priorities:
Land Use and Transit Planning, Pilot Zone Identification

In 2017, Chamblee, Ga. (pop. 28,000) began exploring the possibility of a shared autonomous vehicle pilot to provide first/last mile connections at the city’s MARTA rail station. The $45,000study is being conducted by Stantec, an engineering firm, whose Urban Studio is engaged in several AV projects throughout North America. A draft of the completed feasibility study, which involved community group discussions and an online survey was adopted by the city council in March 2018, and proposes a number of possible driverless shuttle routes serving the city’s main thoroughfare of Peachtree Road, including employers such as the Centers for Disease Control, Internal Revenue Service, and the Peachtree-Dekalb Airport. Key findings include an estimated operating cost of $12,000 to $14,000 per month per vehicle, issue 70 percent less than conventional human-driven, full-size buses on the same routes.

Driverless shuttles could be coming to DeKalb County city

By: Brian Jahnson
Updated: Mar 18, 2019 - 3:47 PM

Chamblee eyes launching autonomous vehicle shuttle routes
(Video)
Press

Initiative on Cities and Autonomous Vehicles

Chamblee, US is preparing

Policy and Planning Priorities:

Land Use and Transit Planning, Pilot Zone Identification

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GA: What would a self-driving shuttle on Peachtree Road look like?
Shuttles without a driver behind the wheel could be rolling onto a busy DeKalb County corridor.

March 15 - March 15 - Shuttles without a driver behind the wheel could be rolling onto a busy DeKalb County corridor.

At a meeting next Tuesday, Chamblee City Council is set to vote on a resolution to apply for a grant from the U.S. Department of Transportation that would fund a set of self-driving shuttles.

Chamblee’s proposal for a self-driving shuttle pilot program is part of the city’s efforts to take advantage of new technology and boost economic development. The city has looked into the possibility of autonomous shuttles, which would take passengers up and down Peachtree Road, since 2017.

"This whole idea of an autonomous shuttle for last-mile connectivity seemed intriguing," Chamblee Mayor Eric Clarkson said in an interview. "We could really be on the leading edge of this.

The federal grant can be up to $10 million; if Chamblee applies and is chosen, the city would provide $100,000 toward the pilot program. Clarkson said he expects the
Would metro commuters ride a self-driving shuttle?

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Could Self-Driving Shuttltes Come to Chamblee?

Chamblee is one of four cities 2019 Smart Communities Challenge. Cities across the country were asked to submit ideas for self-driving vehicles—think a self-driving Uber connected to sidewalks. Some of the ideas may show up in Chamblee.

AJC

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J.D. CAPELOUTO MARCH 15, 2019
THE ATLANTA JOURNAL-CONSTITUTION


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Recommendations

- Minor infrastructure modifications
- Stop modifications
- Turn-around locations
- Charging requirements
- Service profile
- Cost estimates
Service Profile
Future Investments
Actions

1. Stakeholder Buy-In: Support & Funding
2. Vehicle Vendor Evaluation: Determine which vehicle to purchase
3. Manufacturer’s Site Review
4. Manufacture Vehicle & Import
5. Route Programming & Testing
6. Operator Training
7. Service Launch
Opportunities

- Grants:
  - USDOT Driverless Shuttle Demonstration Grant
  - ATL call for projects
  - ARC Transportation Systems Management & Operations (TSMO)
  - Olli Challenge

- Freight Corridor/Connected Emergency Fleet
Autonomous Shuttle Buses

The promise of automated, electrified, shared mobility:

• Increased frequency, lower cost transit service

• More livable streets and redeveloped parking lots

• Increased social capital

• In GA: 2 test tracks, 1 operating, 3 planned, 1 proposed
The hurdles of implementing AV shuttles:
- Approx. 60 in operation today, none living up to the promises yet
- Technical concerns
- Cost and regulatory concerns
- Multi-modal competition

Research Question: How can the user experience of getting to, waiting for, and riding on be improved so AV shuttles live up to their promise?

Research Production Timeline: Best Practices Manual for Improving User Experience on AV Shutttles

Researcher Tips: Collaborate early - especially on data collection, capacity, and resources. Consider industry peer reviewers. Leverage students!
**Planning For:** 15 years before planning an AV shuttle, Chamblee’s plans to revitalize its downtown core exemplified Best Practices for expanding mobility and building ridership.

1. **Create a vision and stick to it**
2. **Build on the parking lots**
3. **Rezone to activate street frontages**
4. **Leverage growth and placemaking together**
   - Designed densification
5. **Plan the pedestrian experience**
   - Sidewalks
   - Street trees and streetscaping
   - Mid-block Rail Trail
**Getting To:** The user’s trip is door-to-door and the experience of getting to the transit is just as important as the ride itself.

1. **Integrate AV shuttles into larger mobility networks**
   - Co-locate stops w ride-hailing stops, transit, bike paths, etc.

2. **Expand multi-modal and ”last mile” access**
   - Re-allocate public r.o.w. to include bike lanes
   - Identify ways to improve walkability with “walkshops”
   - Consider improvements to the 2-3 mile bike-shed

3. **Increase safety and trust with more “eyes on the street” near shuttle stops**
   - Appropriate night-lighting along major routes
   - Encourage mixed uses near stops
   - Use shuttle’s ”eyes on the street” to deter crime
**Waiting For:** What if AV shuttle bus stops made time spent waiting more productive, playful and community-oriented?

1. Exceed user’s expectations on safety & comfort
2. Provide real-time information on shuttle status
3. Design stops BOTH to identify the shuttle system AND the individual stop’s neighborhood
4. Activate stops as community hubs
5. Make waiting active time
   • Wifi and recharging stations
   • Invitations to swing, play games, weed a garden
Riding On: All riders want easy, efficient service. Survey results were mixed, mostly along generational lines, on whether they would prefer a silent or social ride.

1. Define the role of the steward with users in mind
   • Experiment: tour guide? social facilitator? ”Mom”? 
   • UK ”Chatty Bus Day”

2. Select the seating arrangement with users in mind

3. Use the flexibility of autonomy to advantage
   • Custom-designed 3D printed vehicles
   • On-demand re-routing to designated stops

4. Seamless payment systems

5. Recognize the value of all users’ time
Managing Data: Autonomy provides both enormous opportunities to collect, store, and manage data to improve user experience, operations, and city streets – as well as questions.

1. What data would be most useful?

2. How much data can the city store, for how long, and who will analyze it?

3. How will privacy be protected?

We asked GT ISYE Masters student Rey Angeles to shape a data management plan.
Data Management Plan

**Phase 1: AV Partner Selection**
Define Data Governance
Organization and Framework

**Phase 2: SAV Pilot**
Double Diamond Process

**Phase 3: SAV Implementation**
Data Collection via APIs
Recollection of User Feedback via Survey/Interview/Social Media
Phase 1: AV Partner Selection

Define Data Governance Organization and Framework
# Defining User Experience (UX) Metrics

## Getting To
- Integrate AV shuttles into larger transit and pedestrian networks
- Seamless transition between transit systems
- Single payment card/app
- Safety/comfort – trees, lighting, benches
- Expand "last mile" multi-modal access to and from AV shuttle stops
- Multi-modal access

## Waiting For
- Exceed user’s expectations on providing them with safety, comfort, and respect
- Comfortable seating setback from street

## Riding On
- Consider Rider Comfort
- Accessibility, atmosphere, security
- Lighting, hard seats, cleanliness
- Safe to ride alone – easy to read facial expressions and body language
- Vehicle care incentives

## Alternative Data Collection Methods
- Google Maps Platform (Distance Matrix API)
- Open Data (DOT)
- Customer Safari
- Customer Safari Journey Map Survey
- ThirdSight (Emovision)
- Survey/Interview
- Customer Journey Map
Phase 2: SAV Pilot

Double Diamond Process

- Observe
- Define
- Ideation
- Prototype

General problem
Divergent Thinking
Convergent Thinking
Divergent Thinking
Convergent Thinking
Solution
Double Diamond Process

Phase 1: Mapping Out
Phase 2: Empathize
Phase 3: Brainstorm Ideas
Phase 4: Prototype on One
Phase 3: SAV Implementation

Data Collection via APIs
Recollection of User Feedback via Survey/ Interview/ Social Media
Phase 3: SAV Implementation

Data Collection via APIs
Recollection of User Feedback via Survey/ Interview/ Social Media
Project Team Contact Information

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• Rey Angeles: Smart Community Corps Intern, rangeles@gatech.edu