Automated Transportation Network Design Initiative

March 2014

The International Institute of Sustainable Transportation (INIST) invites cities, industries and universities to collaborate with INIST to design, develop, and establish a public transportation system: an elevated network of small automated vehicles which are economical, efficient, powered by renewable energy, high capacity, and available on demand.

Introduction

Silicon Valley and many other communities are facing unprecedented commercial sector growth. New construction is moving rapidly, creating serious challenges especially for transportation infrastructure needs. Any new office building is a private initiative, but the streets are part of the commons and not the direct responsibility of building owners or occupants. As such, cities are obliged to adapt their streets to continued growth with inadequate and often antiquated tools. Well-intended planning initiatives are handicapped by regulations which preclude consideration of unproven innovative alternatives. We must ask the question, "Is the automobile, even if automated, the upper limit of human creativity for mobility?"

Cities and other local governmental agencies

Recognizing the need for technological innovation and energy independence, a group of elected officials and city staff representatives have recently created the Automated Transportation Network Association (ATNA). INIST has been conducting visioning meetings with this group to carefully establish the viability of solar powered automated public transportation options. Through this convening, officials have strengthened their shared interest and are discovering new approaches to meet their transportation challenges.

Academic Research

To establish solid technical, urban design and economic foundations for these new approaches, INIST has been fostering centers of excellence for research and development of solar-powered automated transportation networks ("ATN" / "Podcar") – at Delft University, San José State University, Uppsala University and others since 2011. In October 2013, the San José State "Spartan SuperWay" team won the $5,000 first place award and the Uppsala team took the $2,500 second place in INIST's ***Solar Skyways Challenge*** at the annual international Podcar City Conference in Washington, DC.

SPARTAN SUPERWAY

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Industry

Industry participants have two potential ways to benefit from automated public transportation opportunities:

1. As *users,* achieving lower costs and a less stressful commuting experience for their workforce.
2. As *producers*, creating and selling a game-changing solution to the rest of the world, becoming leaders of innovation in the global marketplace.

For example, to capture the imagination of local industry to participate in this emerging market-place, the Transportation Department staff at the City of San José coined the term ATN (Automated Transportation Network). Opportunities to supply the "A" in ATN means new markets for Silicon Valley companies established in electronics, software, control systems, networks, power electronics, sensors, etc.

Rendering by Arup International

Academic Projects Framework

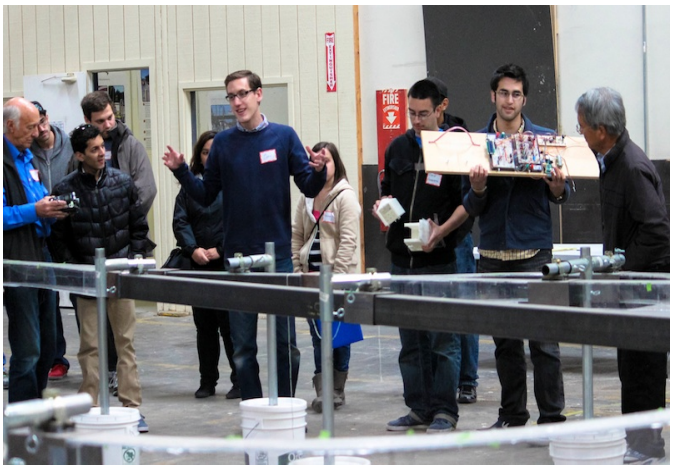
Given the significant resources required for a full scale test track (daunting even for large transportation vendors), INIST is working with San José State and other universities to address the key challenges on the pathway to implementation: urban design, technology (operating scale models, critical component designs), and industry (financing through public private partnerships). A state-of-the-industry report is also being completed by the San José State team.

Cities: Urban Design—Virtual 4D Modeling

The Urban Planning Department at San José State and technology partner Encitra are collaborating with INIST to create 4D models for advanced transportation alternatives in San Jose, Mountain View and Sunnyvale. Selecting appropriate sites, this 4D modeling is a way to communicate possibilities with a visual tool that goes far beyond the usual 2D or 3D images. With the Encitra platform, you interact directly with all possibilities of a development project such as visual impact, noise, sound, light and traffic around you.

Participants in the model can interact with social media – Twitter, Facebook, Google+, blogs and more. Online surveys, movies, slideshows and even real-time meetings between stakeholders can be integrated into the model.

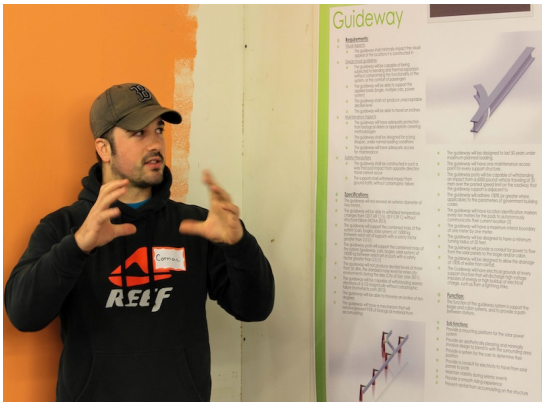
Technology: Control System



SJSU's scaled model completed last year allows visitors to see a suspended podcar system and get a feel for the concept of off-line stations. The six student team working on controls this academic year is enhancing this model to use as their test bed. To accomplish this, Cory Ostermann, a Mechatronics senior, led a team to redesign the drive system and make necessary changes to the track. With the second controllable drive nearly assembled, the controls team at SJSU will begin to test the routing and control software during the spring semester. On-board controllers get directions wirelessly from a routing controller and, in addition to controlling the actuation of the motors driving them, are constantly monitoring on-board sensors for object detection, acceleration, velocity, and position awareness.

In parallel with this development, an Industrial Design student group has designed a fare-box application for smart phones. Imagine scheduling, ticketing and navigating with your phone, avoiding lines to feed money or credit cards into a cantankerous machine as the train rolls up.

Technology: Guideway-Bogie-Switch

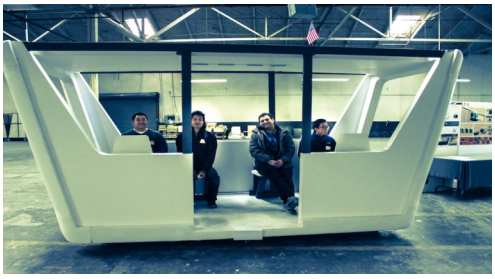


The refinement of certain pieces of the podcar puzzle are on the critical path to a full test track. The switch in ATN systems is quite different than an ordinary train switch. ATN systems need to move many cars through a branching in the track at short headways. Traditional train switches would thus need to flip back and forth every few seconds, a mechanical nightmare. ATN switching is implemented in the drive train of each podcar, allowing for the mechanical locking of the direction choice long before the switch is traversed.

In fall 2013, student teams vetted various guideway, switch, and drive systems. A student team led by Mechanical Engineering student Cormac Wicklow built a wooden prototype over the holidays and is finishing design and beginning construction this spring. This will include a small section of track and the bogie (chassis and wheels).

Technology: Cabin

During the 2013 Fall semester, four student teams from the SJSU Industrial Design Department built mock-ups of three podcars and one simple station. Their design work inspires and sets the stage for a functional full scale podcar Cabin to be combined with the Prototype Switch component to demonstrate more of the key components to the podcar system.



Industry: Financing through Public-Private Partnerships

In anticipation of public-private financing, governments and industry want to understand the potential revenue, capital costs and operating expenses of an ATN system. Students from the Presidio Graduate School are assisting cities and industry with a comprehensive economic analysis to demonstrate revenue and capital recovery potential for ATNs, through innovative policy instruments, appropriate subsidies, fare-box and other sources of revenue.

Industry: MTI ATN Study

Professor Furman, several SJSU students and a team of specialists are collaborating under the direction of the Mineta Transportation Institute to develop a report of the state-of-the-industry for ATN. The study is intended to be an informative tool for planners, urban designers, and those involved in public policy, especially for urban transit. It will be a tool for these professionals to learn about the history and background on ATN, and for policy development and research.

Next Steps

INIST welcomes cities, other governmental agencies, and industry to participate in the development of this advanced transportation solution. Cities and local governmental agencies are encouraged to join ATNA. Contributions received by INIST for our Academic STEAM (Science, Technology, Engineering, Arts, Math) initiatives not only help to create the next generation of skilled professionals, they also create answers to real problems. Bringing multiple sectors together, INIST offers a great way to leverage your giving power.

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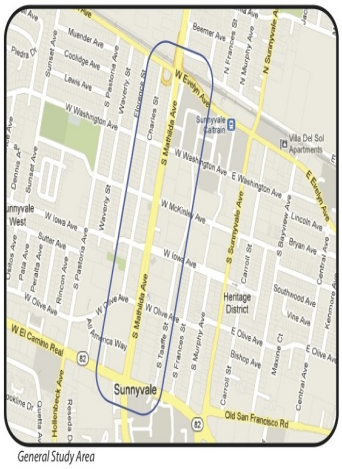

General Study Area