STEAM+ Modelling & Analytics Framework: Latest Advancements

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CIHT Dubai Online Seminar – Bulletin

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About the Event

This fascinating seminar provided valuable insights into the latest advancements to the STEAM+ modelling and analytics framework, including the incorporation of a micromobility model and ongoing enhancements in the analytics platform (FUSION Engine).

The speakers delved deeper into the STEAM+ framework, with its integration of big data, advanced models, and AI-driven visualization tools. STEAM+ represents a significant step forward in transport planning showing how big data including new innovative sources such as mobile phones data & water/electricity consumption data have been used to understand mobility patterns and the transport network needs. The speakers also explained how the data warehouse is not only solving the transportation issue but helping Abu Dhabi city in improving its quality of life.

About the Panel Speakers

Aysha Ahmed AlKhazraji is a Transport Design & Modelling Specialist at Abu Dhabi Mobility with 5 years' experience in Mobility Planning & Modelling.

Brindha Sankari is a Transport Economic Expert in Abu Dhabi Mobility with over 17 years of experience in transport planning and modelling across India, Singapore, and the UAE, she has led numerous projects focused on transport model development and various transport planning studies.

Bharath Paladugu is a Transport Planning & Modelling Specialist at Abu Dhabi Mobility. He has over 15 years of global expertise spanning the USA, UAE, Oman, and India, and is an accomplished expert in transport planning, travel demand modelling, traffic engineering, data systems development, and analytics.

Panel Discussion

In his welcoming remarks, **Martin Tillman**, Chair of CIHT Dubai, welcomed attendees and the speakers of the event.

Aysha Ahmed AlKhazraji began her presentation by introducing STEAM+ Modelling and Analytics Framework. She explained the three main aspects of the STEAM+ framework: Data Warehouse, Transport Models, and Birdseye Visualisation tool. Aysha described how the big data warehouse integrates diverse data sources, including cell phone, water, electricity consumption, and traffic data, providing a comprehensive repository for transport analysis. This data supports both real-time decision-making and long-term planning.

Using a video demonstration, Aysha illustrated how the STEAM+ Framework aids infrastructure solutions at various levels, tests new and future mobility systems, and offers a complete understanding of the city. STEAM, which stands for Strategic Transport Evaluation and Assessment Model, is the official decision-making tool for transport infrastructure investments in Abu Dhabi.

A Tool That Uses AI And Big Data To Support Decision Making in:

CHANGES TO TRANSPORT POLICIES | **CHANGES TO TRANSPORT INFRASTRUCTURE** | **DECISIONS ABOUT LAND USE CHANGES** | **DEVELOPING MASTER PLANS** | **IMPACT OF POPULATION GROWTH** | **INTRODUCTION OF NEW MODES OF TRANSPORT**

Aysha outlined the development of the model since its first release in 2011, emphasizing its regular updates in line with global best practices, with major updates occurring every five years. The STEAM+ model is a four-stage travel demand model incorporating detailed demographic segmentation with 288 categories based on nationality, income, and household size. The forecast year for the model extends to 2050, and it includes over 23 modes of transport, such as rail and metro, accounting for future transportation developments. The model, which operates on CUBE software, boasts more than 100 users, highlighting its extensive application and utility in transport planning and analysis.

Brindha Sankari discussed various advancements in transport modelling, focusing particularly on the micromobility model. She highlighted the increasing importance of micromobility as a mode of transport and detailed the development of an extensive network to support it. She explained four main steps in development of the micromobility model which are surveys, network model, model estimation and local area model. Road-side surveys were utilised to enhance the mode choice model, which previously aggregated all soft modes. Approximately 4,000 samples were collected across nine locations as part of the roadside interview survey.

STEAM Strategic Model - Turbo Model
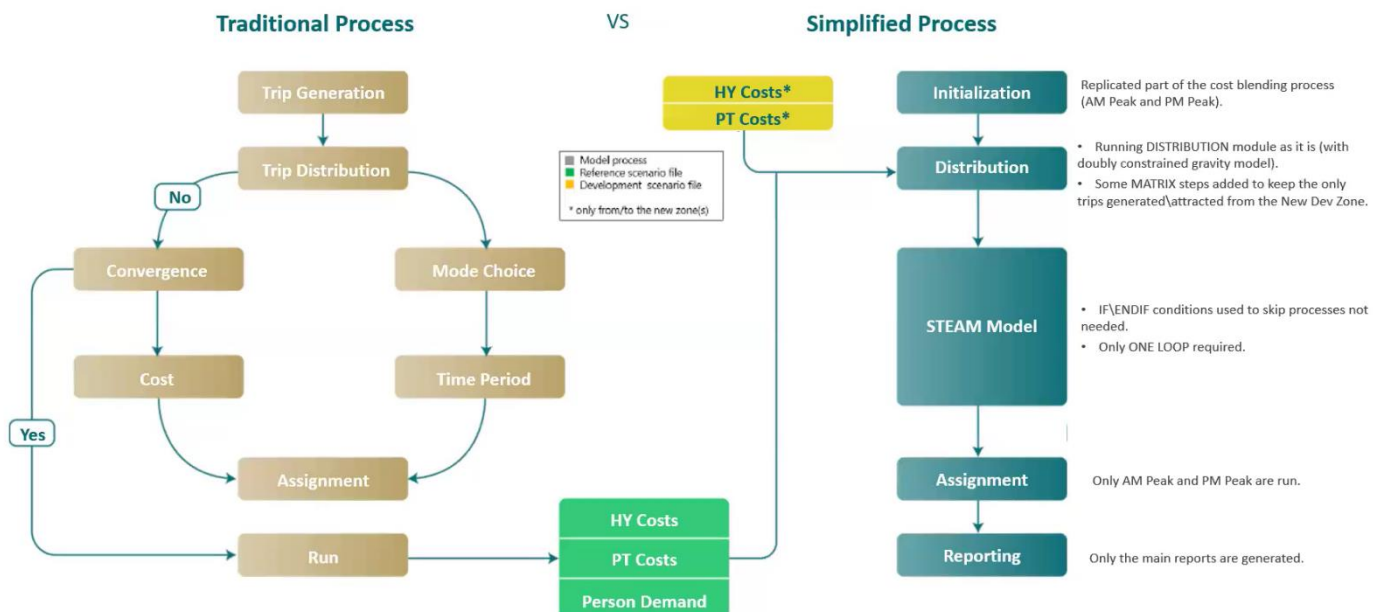
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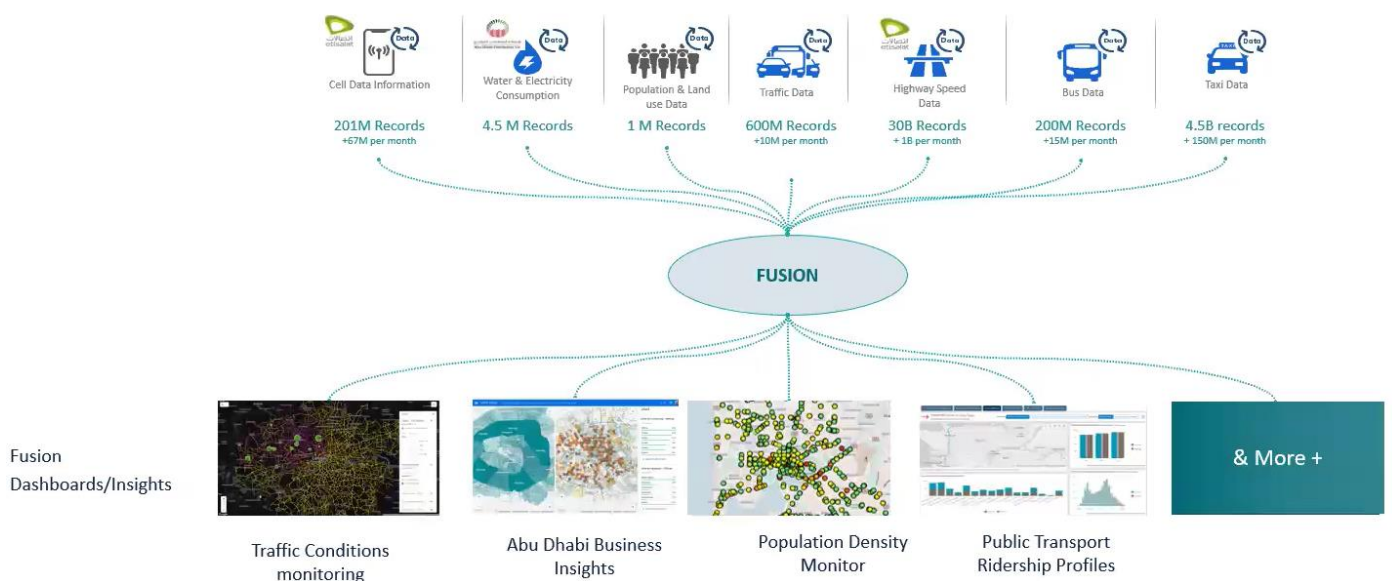
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The network model was enhanced significantly by coding various local level links. Local area now can be developed from the wider strategic model with more detailed zone structure for testing various micromobility schemes. For splitting the zones, use of water and electricity consumption data can be made. Matrix estimation techniques were employed to achieve accurate matrices at the local level using the counts. She described the different types of links and the detailed path choice modelling, which are crucial for testing various scenarios.

Brindha also introduced STEAM Turbo, which significantly reduces the runtime of the model to less than five hours, enhancing user satisfaction by enabling quicker sensitivity tests and more efficient model runs. The model runtime has been reduced through simplification of the modelling steps and addition of various if conditions.

Additionally, she presented the STEAM Hybrid model, which operates on AIMSUN software and is one of the first three-tiered models in the MENA region. This comprehensive hybrid model network is one of the standout features of this model. It includes extensive neighbourhood network, all junctions, detector locations and public transport routes, offering dynamic route features. The data warehouse provides raw data, extracting traffic information from pattern calendars. The hybrid model is currently used for various studies, demonstrating its utility and effectiveness in transport planning.

Bharath Paladugu focused on further improvements in the STEAM+ framework, particularly emphasizing the Data Warehouse. He highlighted that the Data Warehouse now contains over 75 billion rows of data, encompassing mobile phone data, water and electricity data, and highway speeds data updated minute by minute from sources like INRIX, Google, and TomTom. Additionally, it includes data from bus and taxi fleets, pick-up and drop-off locations, traffic counters, SCOOT detectors, school buses, and freight, all centralized into one comprehensive repository.

Bharath presented various data analytics use cases such as instant catchment analysis, student commute patterns, monthly traffic tracker, 360 area profiles, population density, hotpot analysis and taxi pickup and drop off analysis. He provided sneak peek into Data Fusion on how a combination of various data sources can provide information on demographics, traffic patterns etc. Bharath also discussed the capabilities of catchment analysis for quality-of-life assessments, enabling planners to estimate and analyse the impact of adding parks or community facilities. He pointed out the issue of illegal taxi pickup drop-off locations and the long-distance commute problems faced by students, suggesting that some curriculum could be strategically located to alleviate these issues.

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He introduced the next-generation Fusion engine, noting how the time required for queries is significantly reduced with a thorough data cleansing process and new database formatting. Land use engine is one of the use cases of the fusion engine, which predicts impact of land use change instantly using machine learning and AI techniques at a high-level. Using the models that have been already analysed with data from close to 14,000 scenarios, bigdata warehouse and the hybrid simulation model. He highlighted another use case, the flow engine which uses power of machine learning by identification of 21 patterns and can be used to estimate traffic at various locations through time of the year in Abu Dhabi. Lastly, he presented the enhanced visualization capabilities of the Birdseye Visualization engine.

In conclusion, the seminar showcased the latest advancements in transport modelling and analytics. The STEAM+ framework, integrating big data, advanced models, and AI-driven tools, represents a significant advancement in transport planning. Its ability to simulate future scenarios and support decision-making processes is crucial for developing efficient and sustainable transport solutions for Abu Dhabi and beyond. The discussions underscored the importance of continuous innovation and adaptation in transport planning to meet evolving urban needs, highlighting the transformative potential of advanced transport models and analytics in shaping future urban landscapes.

Questions

How far are we from the models that will be calibrated in real-time using the various data sources available such as cell phone data?

During the latest major model update, AD Mobility was faced with a challenge of not being able to collect the data using traditional way of household surveys. AD Mobility used the fusion engine with historical household survey data and mobile phone data to overcome this challenge. This data can be used for rebasing the model, but it can be done every couple of years as strategic model looks at more long-term changes. The data however can be more useful in calibrating the hybrid model where the use cases are more focused on short term changes.

Is STEAM an Activity Based Model?

STEAM is a traditional four stage model with a very detailed segmentation.

How is the performance of the STEAM Turbo and with the shortening of the model run time can it still be used for traffic analysis and high-level discussions with the authorities? Any specific settings needed to use STEAM Turbo?

Traditional model runs for 25 to 40 hours, whereas the STEAM Turbo takes maximum of 5 hours for one scenario. STEAM Turbo can be used for high level discussions however the traditional model will still be required to be used for TIS/TMP studies. STEAM Turbo is a module in the wider traditional model and can be accessed through a couple of catalogue keys.

Are there any real-world examples of the use cases of the Micromobility model for assessing any proposed scheme?

The tool is yet to be launched.

Are there any apps integrated in STEAM+, such as micromobility isochrones using the STEAM matrices?

Apps are built in the data analytics engine but not in the STEAM model. There is a web-based tool that is used for creating the isochrones using information from hybrid simulation model.

What's the difference between Fusion Engine and Birdseye?

Fusion engine is the brain that brings together the data warehouse which does the analytics. Birdseye is the visualisation platform.

Does the e-scooter demand calculate considers the urban freight deliveries?

Currently the model does not consider the deliveries done by e-scooters.

Will the STEAM Turbo and Land Use Engine be available for the STEAM Users?

There is a plan of rolling out STEAM Turbo for the STEAM users through soft launch in some studies. Land Use Engine is an internal tool and there is currently no plan of rolling out to model users.

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Is the STEAM+ Model setup to model the autonomous public transport?

There is an autonomous vehicles module in the model in STEAM version 3. There is an implemented autonomous vehicles fleet in Abu Dhabi with geofence applied to it, the model has the capability that user can define the geofence to model the autonomous vehicles in the future.

Are the charging facilities coded in the model? How does it affect the distribution patterns?

The input of specific charging location is currently not there in the model. But by areas it is possible to define how many charging stations are available along with the electricity consumption rates.

What technology/platform is used for the big data warehouse?

The technologies used for the Big-Data Wearhouse are Microsoft technologies - Data Integration (SSIS) + MS SQL for storage along with Python in conjunction with GIS tools.

Is STEAM+ a strategic model using CUBE software?

 STEAM+ is a framework, Strategic model is one of the components built in Cube. STEAM+ also includes a big data warehouse, Hybrid simulation model in AIMSUN, as well as Analytics and Visualization engines.

Is ITC (AD Mobility) a government organisation? If so, how does it use the model to help consultants and private developers in land use planning?

Yes, it is an Abu Dhabi Government entity. Access to the model can be provided to the developers in private sector to do their transport and planning studies.

Is there a UAE/AD specific economic appraisal Guide? is the methodology to estimate BCR similar to TAG in the UK?

 Yes, there are Feasibility Guidelines for Abu Dhabi as well as an Economic & Environmental Assessment module within the STEAM model that looks at the appraisal of scenarios.

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