RUBIX Application Spotlight

Automated Trail Inspection

Spotlight Overview

RUBIX for Trails and Sidewalks

Implementing an effective program for managing trails and sidewalk condition present several unique challenges as compared to other transportation assets like roads or bridges. Primarily, these networks are used by pedestrians, with safety being the primary driver of a management strategy. These networks are used by modes of use including, walking, biking, wheelchair, walkers, etc.). These diverse usages are key factors that RSI considers in its comprehensive approach to managing these assets.

Our solution (RUBIX) automatically collects various types of performance data along a Trail network. Once collected, our platform analyzes the data and sends it to a live dashboard that displays the information in a geospatial format. Stakeholders can then take proactive actions, build maintenance strategies, and develop budgetary plans to meet the defined service levels.

The solution offers a simple, cost effective approach to rapidly inspect and inventory your Trail network.



At a high level, RUBIX is a simple infrastructure inspection and management solution that allows users to efficiently gather and host performance and deterioration information related to various types of infrastructure. Further, the solution aids decision processes related to managing these transportation assets. The solution is comprised of automated field collections apps, web-based visualization tools, and customizable data analysis and reporting/export tools.



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Inside this Spotlight





The first "DataBike" powered by RUBIX technologies





RUBIX Automated Methods

for Trail and Sidewalk Condition Assessments





Condition Assessment from <u>**Rideability</u>**</u>

Condition Assessment from Surface Defects



rRuf is a is a customized app for the iPhone that uses accelerometers and gyros to produce a Class 3, response-based roughness/smoothness performance index. This data is automatically tagged to the appropriate infrastructure segment by using the devices GPS and an intelligent map matching algorithm. rRuf is also used to collect continuous high resolution (2K / 4K) mobile images.

Surface inspections are generated through an advanced analysis of mobile images gathered from action cameras. The collected data is processed by a robust image processing engine built on the RUBIX platform. This tool, **rVision**, uses Artificial Intelligence (AI) and produces a detailed inventory of surface defects such as cracking and computes an overall condition ranking based on the detected defects.

Inventory of Appurtenances

The **<u>rInspector</u>** app in customizable to allow for the inventory of additional trail features in real time while biking the trails. This can also be used to aid in the training of new AI workflows tailored to your business needs.

RSI offers both standard and highly customizable Trail Inspection workflows, utilizing a wide array of advanced technology approaches and innovative solutions, designed to adapt to the unique and specific needs of your project. This ensures optimal efficiency, accuracy, and success in every phase of the inspection process.





Results and Deliverables

for Trail and Sidewalk Condition Assessments

The motion and location information collected from the device is automatically processed and produces a classified Trail Condition Index (TRCI) indicating the relative smoothness of a trail. The TRCI data is represented at different levels of detail, mainly:

- Short Intervals (shown below) used to identify hotspots
- Segments (shown on the right) for network level ranking and analysis
- Groups of Segments for higher level comparison of overall Trail Systems



Fully integrated web image viewer allows users to easily navigate and virtually drive through trail images collected. Images are automatically link to a GIS map and can be downloaded, with the

to easily navigate and virtually drive through trail images collected. Images are automatically link to a GIS map and can be downloaded, with the ability to blur sensitive content like people's faces and licence plates. The RUBIX image viewing capability supports both 2D planar images as well as 3D panoramic images.

For more advanced analysis, images can be analysed through the RUBIX AI module, **rVision**. This workflow detects more detailed surface defects on trails such as cracking, edge defects, and potholes. These detects are classified in terms of the severity (width of crack) and extent (computed areas or lengths) of the affected areas. These details are further rolled up to produce a Surface Condition Index representing the overall surface quality of a Trail.

Additional Deliverables and Capabilities

- Al Training for custom applications
- Capital Planning and Priority Programming
- Trip Hazard Locations
- Automated Sign Detection
- Automated Surface Material Detection



- Customizable appurtenance form entry
- Direct Access through REST API
- Detailed Defect Locations and Geometries
- GIS Network Map discrepancies reports
- ESRI, Excel, CSV Export Formats





Highlight Project 2022 MassDOT Trail Condition Study

"MassTrails recently conducted a statewide study to evaluate the current surface conditions of multi-use trails across Massachusetts. Throughout the summer of 2022, we collected surface condition data on 345 miles of trails, inventoried assets along trail facilities, and captured 360 imagery for Google Street View. The resulting data will be used to inform maintenance and modernization opportunities for Massachusett's trails."

Kittleson Associates - Massdot Trail Condition Study

Kittleson Associates contacted RSI in 2022 to provide a data inspection solution for evaluating the condition of trails throughout Massachusetts. The RUBIX platform was implemented and tailored to the project's specific requirements. Over several months, field data collection, including trail smoothness (user rideability), images, and appurtenances, was carried out. The processed data was then extracted from RUBIX and used to generate a comprehensive report on the overall condition of the trail network.

The outputs of this study serve many purposes for trail users, state agencies, and other stakeholders. The surface condition ratings will enable agencies and municipalities to evaluate trail conditions similarly to how they assess roadways. The user experience ratings will offer a comprehensive overview of entire trail systems, while the detailed interval ratings will help pinpoint specific segments in need of resurfacing. As funding for trail rehabilitation and modernization becomes available, MassDOT and other agencies can use these assessments to prioritize trails that require the most urgent attention.



Other users of RUBIX for Trail and Sidewalk Condition Assessments







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