

Automating BSRU Book Reviews

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BSRU Project Overview

The **Bus Stop Replacement Upgrade** project is a currently-ongoing effort to replace all ~9,000 bus stops in metro Atlanta with customer-friendly signage that includes information such as route numbers, names, EOLs, stop numbers, and operator info (for shared stops)



Audits of the work done by MARTA's contracting partners has revealed a number of **quality control issues**, requiring each mock design to be *manually checked* before work begins

★ *Most Important and Most Time-Consuming* ★

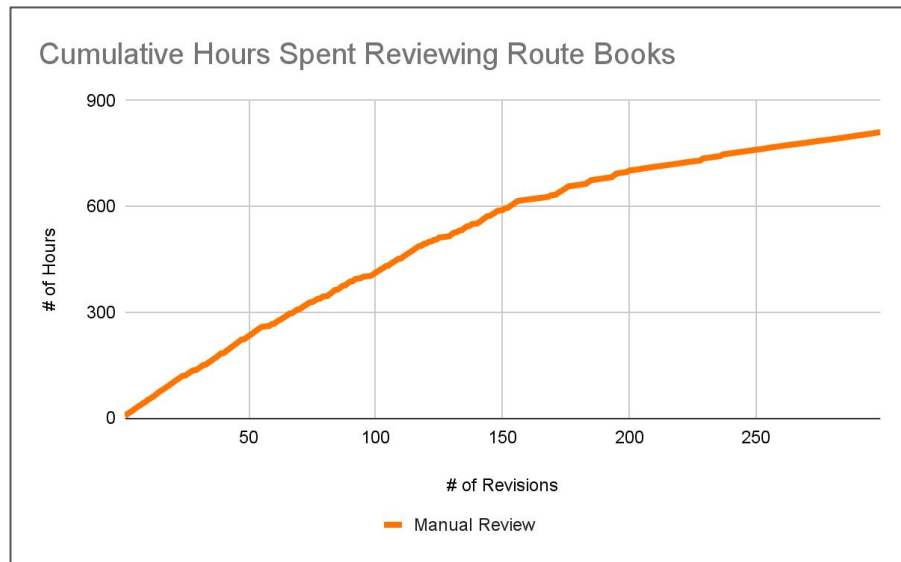
Is the **Route Panel Information** accurate and spelt correctly?
Does it include a **TP** or **EOL** sign, if required?

Do the **Route and Brand Panel sizes** match the invoice?

Is the **PIP Number** the same as the Stop Number?

The Main Problem

Reviewing a single route's "book" of mock-ups would take someone ~5 hours, and multiple revisions were frequently needed as information changed, but errors were still slipping through the cracks



Projected cumulative hours needed to review all route books manually is ~800

Assumes ~5 hours for first revision, and 2-3 later revisions at ~1 hour each

Developing Solutions

Two tools were created to expedite the most tedious tasks:



PinDrop

Leverages the capabilities of *Google Earth* and *StreetView* to speed up verification of bus stop placement



Sherlock

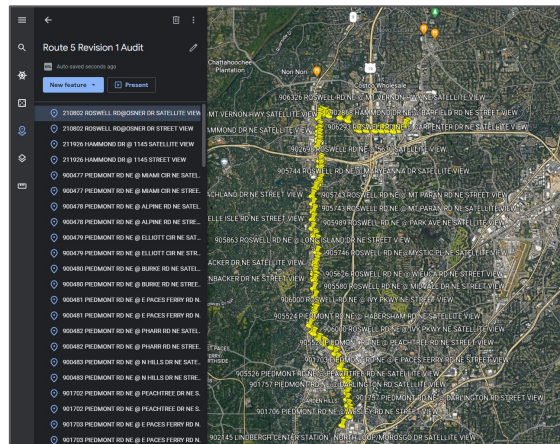
Automatically scans and extracts text information from route books and compares to sources-of-truth

How It Works: PinDrop

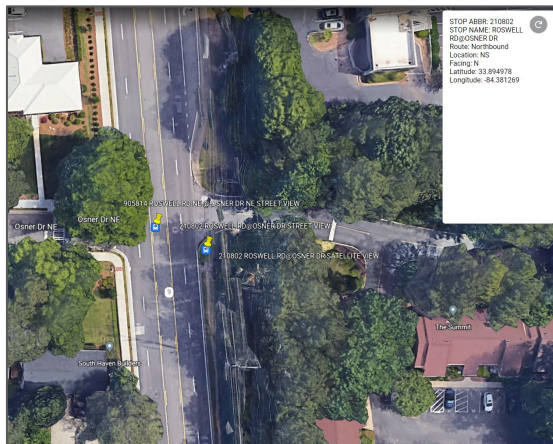
PinDrop generates .kml files that are compatible with *Google Earth*, and allows a user to follow a bus route stop-by-stop, switching between satellite and street views to verify stop location and surrounds

```
1 <kml version="1.0" encoding="UTF-8">
2 <kml xmlns="http://www.opengis.net/kml/2.2" xmlns:gx="http://www.google.com/kml/ext/2.2" xmlns:atom="http://www.w3.org/2005/atom">
3 <?xml-stylesheet href="http://www.google.com/kml/ext/2.2" type="text/css" />
4 <name>Route 5 Revision 1 Audit</name>
5 <Placemark id="210802SAT">
6 <name>210802 ROSMELL RD@OSMER DR SATELLITE VIEW</name>
7 <description>[[[DATA[STOP ADDR: 210802]<br>STOP NAME: ROSMELL RD@OSMER DR<br>Route: Northbound<br>Location: NS<br>Facing: N<br>Latitude: 33.894978<br>Longitude: -84.381269]]]</description>
8 <LookAt>
9 <longitude>-84.381269</longitude>
10 <latitude>33.894978</latitude>
11 <altitude>200</altitude>
12 <heading>0</heading>
13 <tilt>0</tilt>
14 <gx:fovy>0</gx:fovy>
15 <range>0</range>
16 <altitudeMode>relativeToGround</altitudeMode>
17 </LookAt>
18 <Point>
19 <coordinates>-84.381269,33.894978</coordinates>
20 </Point>
21 </Placemark>
22 <Placemark id="210802STR">
23 <name>210802 ROSMELL RD@OSMER DR STREET VIEW</name>
24 <description>[[[DATA[STOP ADDR: 210802]<br>STOP NAME: ROSMELL RD@OSMER DR<br>Route: Northbound<br>Location: NS<br>Facing: N<br>Latitude: 33.894978<br>Longitude: -84.381269]]]</description>
25 <Camera>
26 <gx:ViewOptions>
27 <gx:option name="streetview"></gx:option>
28 </gx:ViewOptions>
29 <longitude>-84.381269</longitude>
30 <latitude>33.894978</latitude>
31 <altitude>200</altitude>
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33 <tilt>90</tilt>
34 <roll>0</roll>
35 <gx:fovy>0</gx:fovy>
36 <range>0</range>
37 <altitudeMode>relativeToGround</altitudeMode>
38 </Camera>
39 <Point>
40 <coordinates>-84.381269,33.894978</coordinates>
41 </Point>
42 </Placemark>
43 <Placemark id="211926SAT">
44 <name>211926 HAWPOND DR @ 1145 SATELLITE VIEW</name>
45 <description>[[[DATA[STOP ADDR: 211926]<br>STOP NAME: HAWPOND DR @ 1145<br>Route: Northbound<br>Location: AF<br>Facing: NE<br>Latitude: 33.918973<br>Longitude: -84.348156]]]</description>
46 <LookAt>
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48 <latitude>33.918973</latitude>
49 <altitude>200</altitude>
50 <heading>0</heading>
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53 <range>0</range>
54 <altitudeMode>relativeToGround</altitudeMode>
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56 <Point>
57 <coordinates>-84.348156,33.918973</coordinates>
58 </Point>
59 </Placemark>
60 <Placemark id="211926STR">
61 <name>211926 HAWPOND DR @ 1145 STREET VIEW</name>
62 <description>[[[DATA[STOP ADDR: 211926]<br>STOP NAME: HAWPOND DR @ 1145<br>Route: Northbound<br>Location: AF<br>Facing: NE<br>Latitude: 33.918973<br>Longitude: -84.348156]]]</description>
63 <Camera>
64 <gx:ViewOptions>
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How It Works: PinDrop



This is what a full route generated with PinDrop and loaded into Google Earth looks like - each yellow pin is a bus stop on the route



Each stop is first presented from it's birds-eye satellite view, to check *placement*, *location*, and *facing* info



Then, each stop is presented from street view, allowing users to compare the surroundings to the *location pictures* from the route book

How It Works: Sherlock

Sherlock uses *Python* and Optical Character Recognition (OCR) technology to **extract and store text information** from each page in the route book, before **comparing it to other sources-of-truth** for accuracy

STOP NUMBER 212021 / SIGN TYPE 101
N COMMERCE DR @ MARKETPLACE BLVD

GEO LOCATION:
33.658464, -84.503924

NOTE: NEW POST REQUIRED

NOTE: REQUIRES MOUNTING PLATE AND ESCUTCHEON

INSTALL CONDITION: ST101.A

EXISTING CONDITION

MEDIUM DIF 101 ROUTE PANEL
SCALE: 1 1/2" = 1'-0"

SMALL DIF 101 BRAND PANEL
SCALE: 1 1/2" = 1'-0"

S/F PASSENGER PANEL
SCALE: 3" = 1'-0"

PROPOSED OVERLAY
DATE: 08/11/18

WALTON

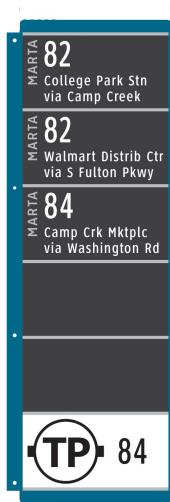
Client: ATLANTA REGIONAL COMM
Address: METCALLE ST
Location: ATLANTA, GA
Date: 08/11/18
Drawn by: J. L. L. L.

Revision Notes:
1. This is an original drawing created by Walton. It is intended to provide a visual representation of the proposed sign design. It is not a final design and should not be used for construction without the approval of the client. 2. The client is responsible for providing the necessary information and data to create this drawing. 3. The client is responsible for obtaining the necessary permits and approvals for the proposed sign design. 4. The client is responsible for ensuring that the proposed sign design complies with all applicable codes and regulations. 5. The client is responsible for ensuring that the proposed sign design is clearly visible and legible. 6. The client is responsible for ensuring that the proposed sign design is aesthetically pleasing. 7. The client is responsible for ensuring that the proposed sign design is durable and long-lasting. 8. The client is responsible for ensuring that the proposed sign design is safe and secure. 9. The client is responsible for ensuring that the proposed sign design is properly installed and maintained. 10. The client is responsible for ensuring that the proposed sign design is properly removed and replaced when necessary.

DATE: 08/11/18
Drawn by: J. L. L. L.
Check by: J. L. L. L.
DATE: 08/11/18
Drawn by: J. L. L. L.
Check by: J. L. L. L.

PAGE SIZE: 11x17
Sheet: 41

How It Works: Sherlock



MARTA **82**
College Park Stn
via Camp Creek



Route Num: **82**
End of Line: **College Park Stn**
Via / Name: **Camp Creek**

MARTA **82**
Walmart Distrib Ctr
via S Fulton Pkwy



Route Num: **82**
End of Line: **Walmart Distrib Ctr**
Via / Name: **S Fulton Pkwy**

MARTA **84**
Camp Crk Mktplc
via Washington Rd



Route Num: **84**
End of Line: **Camp Crk Mktplc**
Via / Name: **Washington Rd**



Is Time Point? **TRUE**
Is End of Line? **FALSE**

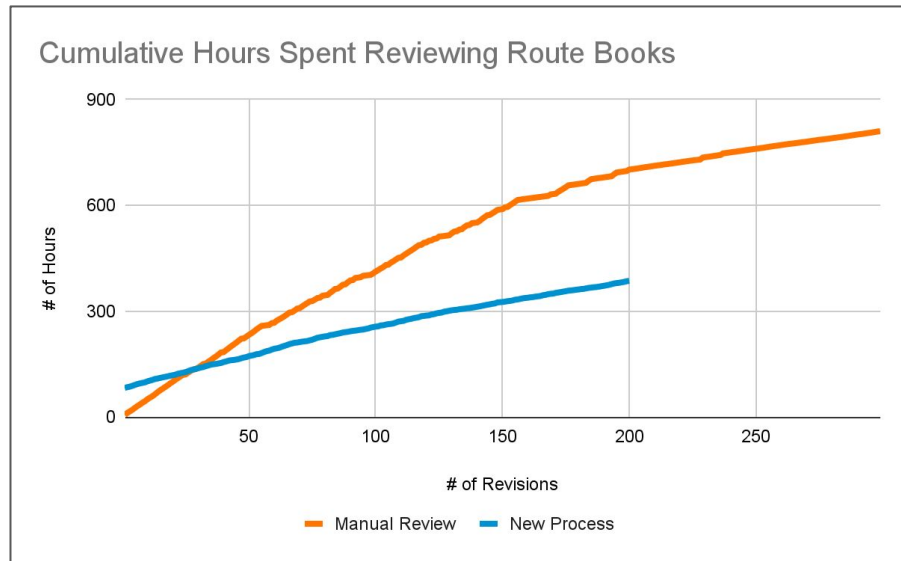
Sherlock starts by cropping the PDF to just the area of interest

Then, it **uses image processing techniques to identify shapes** such as boxes or circles that might contain text

Each shape is individually evaluated, and blank ones are discarded, while **text is extracted from the rest and stored in an excel file for further comparison analysis** to sources of truth (Decal Sheet, SmartSheet, etc.)

Impact

Approximately 80 hours of work was invested in creating both tools, but we expect overall time savings through faster reviews and fewer overall revisions due to the tools' higher accuracy



Projected cumulative hours needed to review all route books with tools is ~400

Assumes ~2 hours for first revision, and 1-2 later revisions at ~1 hour each