

VREVAL

Documentation & Result Analysis

Edited by

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ABOUT DOCUMENTATION & RESULT ANALYSIS

About Documentation

Each study must be well documented.

For the purpose of documentation, different archive files can be downloaded from the VREVAL website.

The following documentation / archive can be downloaded:

- Project
- Evaluation
- Participant Log
- Evaluation Results

About Result Analysis

A key for a useful study is the evaluation and interpretation of the results.

Each task can get interpreted differently. It is very important, to know, that the basic result evaluation methods are, to dive even deeper into the analysis. If the basic result analysis process is known, even better research question can be asked.

1. DOCUMENTATION

Example: Project.json

The **project** archive is saved in the format json.

```
comment: null
version: 3
created_formatted: "2 weeks ago"
groups:
  4:
    id: 4
    name: "A"
    playlist_ids:
      0: 16
      1: 18
      2: 17
    evaluation_id: 5
  5:
    id: 5
    name: "B"
    playlist_ids:
      0: 16
      1: 19
      2: 17
    evaluation_id: 5
questions:
  0:
    options:
      0: "yes"
      1: "no"
    question: "Is your background in architecture?"
    ends_on: "Jul 27, 2021 18:48"
    underway_since: "2 weeks"
```

project snapshot version

group

used playlists by ID

Classification Question

1. DOCUMENTATION

Example: Evaluation.json

The **evaluation** archive is saved in the format json.

General Structure

```
id: 52
project_id: "9133c04a-17fb-4031-9a5c-a3f2f5604c00"
evaluation_id: 5
comment: null
version: 4
project_data:
  id: "9133c04a-17fb-4031-9a5c-a3f2f5604c00"
  name: "Tutorial"
  forms: []
  models: []
  playlists:
    16:
      id: 16
      mode: "standard"
      name: "Start"
  scenarios:
    0: 7
    17: (-)
    18: (-)
    19: (-)
  checkpoints:
  description: null
  updated_relative: "21 seconds ago"
  created_formatted: "Jul 6, 2021"
created_at: "2021-08-02T09:40:51.000000Z"
updated_at: "2021-08-02T09:40:51.000000Z"
created_formatted: "12 seconds ago"
```

```
scenarios:
  7:
    id: 7
    name: "Interface"
    tasks:
      81:
        id: 81
        type: (-)
        uuid: "1c1f4c9c-4b11-4416-b1b1-707084fedc91"
        type_id: 10
        template:
          text: "New default task"
        models:
          0:
            id: 266
            name: "MLH_E - Arch 01"
            model_id: 43
            tag_list: []
            description: null
            attached_model: "MLH"
            1: (-)
            form_id: 85
            required: false
            type_name: "Default"
            visibility: "always"
            description: ""
            hmd_tracking: false
            checkpoint_id: 97
            auto_open_form: true
            time_to_answer: -1
            add_description: false
            avatar_settings: {}
            visibility_options: {}
            positional_tracking: false
            time_to_answer_unit: "seconds"
            allow_multiple_visits: false
            hmd_tracking_interval: 10
            positional_tracking_interval: 4
            field_index: 0
            description: null
            updated_relative: "11 seconds ago"
            created_formatted: "Jul 6, 2021"
          97:
            id: 97
            name: "Floor 01 BalconyStreet"
            cad_id: "4402857"
            type_id: 6
            template: (-)
            updated_relative: "3 weeks ago"
            created_formatted: "Jul 9, 2021 11:36"
          98: (-)
          99: (-)
          100: (-)
          101: (-)
```

```
forms:
  85:
    id: 85
    name: "Welcome"
    fields:
      311:
        id: 311
        type: (-)
        type_id: 1
        template: (-)
        field_index: 0
      312:
        id: 312
        type: (-)
        type_id: 4
        template:
          text: "Are you excited to start the evaluation?"
        options:
          0:
            text: "Yes"
          1:
            text: "No"
            multiple: false
            required: false
            type_name: "Selection"
            shuffle_options: false
            field_index: 1
    project_id: "9133c04a-17fb-4031-9a5c-a3f2f5604c00"
    description: null
    updated_relative: "21 seconds ago"
    created_formatted: "Aug 2, 2021"
    models:
      43:
        id: 43
        name: "MLH"
        path: "/storage/models/9133c04a-f5604c00/1626036962/mlh"
        designs:
          0:
            id: 266
            name: "MLH_E - Arch 01"
            tags: []
            description: null
            1: (-)
            2: (-)
            3: (-)
            4: (-)
            5: (-)
            6: (-)
            7: (-)
            8: (-)
            9: (-)
            10: (-)
            11: (-)
            12: (-)
            13: (-)
            14: (-)
            15: (-)
            16: (-)
        description: null
        updated_relative: "3 weeks ago"
        created_formatted: "Jul 11, 2021"
```

1. DOCUMENTATION

Example: Participant_Log.json

The **participant log** is saved in the format json.

```
▶ 2:      {...}
▶ 3:      {...}
▶ 4:      {...}
▼ 5:      Conducted Evaluation by Participant
  id:      700
  evaluation_id: 16
  evaluation_snapshot_id: 41
  project_snapshot_id: 36
  group_id: 22
  classification: "0"
  code:      "BLTY-T716-ACDN"
  ▼ log:
    ▼ 0:
      content:      "Logged in"
      context:      "app"
      timestamp:    "2021-07-23T08:21:59+02:00"
    ▶ 1:      {...}
    ▶ 2:      {...}
    ▶ 3:      {...}
    ▶ 4:      {...}
    ▼ 5:
      content:      "Generated results for task id: 6"
      context:      "client"
      timestamp:    "2021-07-23T09:39:25+02:00"
    ▶ 6:      {...}
    ▶ 7:      {...}
    ▼ 8:
      content:      "Logged out"
      context:      "app"
      timestamp:    "2021-07-23T09:39:40+02:00"
  first_login: "2021-07-23 08:22:03"
  logged_in_at: null
  completed:   "2021-07-23 09:39:39"
  created_at:  "2021-07-22 16:24:31"
  is_online:   false
  status:      "completed"
  ▼ completed_tasks:
    0:      "33.29.33.0"
    1:      "34.3.4.1"
    2:      "34.4.5.1"
    3:      "35.5.6.0"
    4:      "35.31.36.0"
▶ 6:      {...}
```

Log for actions during evaluation

- Start
- End
- Generated (saved) results
- Task Termination, Medical reason etc.

Log for completed task

1. DOCUMENTATION

Example: Result.json

The **participant log** is saved in the format json.

Results, which are saved are the following:

- Form – Selection
- Form – Rating
- AB-Test
- Wayfinding – Trajectory, start & end point
- Placing – Marker Position
- Annotation – Marker Position and Form results (identification by UUID)

```
▶ 3: (-)
▶ 4: (-)
▶ 5: (-)
▶ 6: (-)
▼ 7:
  evaluation_id: 16
  project_snapshot_id: 36
  evaluation_snapshot_id: 41
  group_id: 22
  classification: "1"
  completed_at: "2021-07-22 14:53:02"
  playlist_name: "DSK Intro"
  playlist_id: 33
  scenario_name: "Introduction (Desktop)"
  scenario_id: 29
  participant_id: 738
  task_id: 33
  task_type: "task-default"
  task_text: "VREval Introduction"
  task_code: "33.29.33.0"
  task_result_id: 114
  task_results:
    ▼ 0:
      uuid: "8dd5a1f-252e-4f2c-b12d-0b7d04ea09bc"
      is_using_vr: false
      ▶ result_type: "Vreval.Client.SavingSystemResult, Vreval.Client"
      sequence_index: -1
      checkpoint_name: "Street - Billboard"
      ▶ checkpoint_position: [-]
      ▶ checkpoint_rotation: [-]
      ▶ checkpoint_survey_point: [-]
      checkpoint_project_rotation: 0
      checkpoint_height: 1.2
      cad_id: 4403070
      form_id: 29
      form_results:
        ▼ 0:
          form_field_id: 153
          ▶ form_field_text: "Which of these situation.e most relevant to you?"
          form_field_type: "form-field-selection"
          ▶ form_field_input: [-]
        ▼ 1:
          form_field_id: 156
          ▶ form_field_text: "In which of the followin../ Virtual Environments?"
          form_field_type: "form-field-selection"
          ▼ form_field_input:
            0: "No Experience"
          ▶ 2: (-)
          ▶ 3: (-)
    ▼ 8:
      evaluation_id: 16
      project_snapshot_id: 36
      evaluation_snapshot_id: 41
      group_id: 22
      classification: "1"
      completed_at: "2021-07-22 14:54:27"
      playlist_name: "StableStart"
      playlist_id: 34
      scenario_name: "Placing"
      scenario_id: 4
      participant_id: 727
```

Results of one task

General Information about Result

General Information about Task

Results of Task.

2. RESULT ANALYSIS

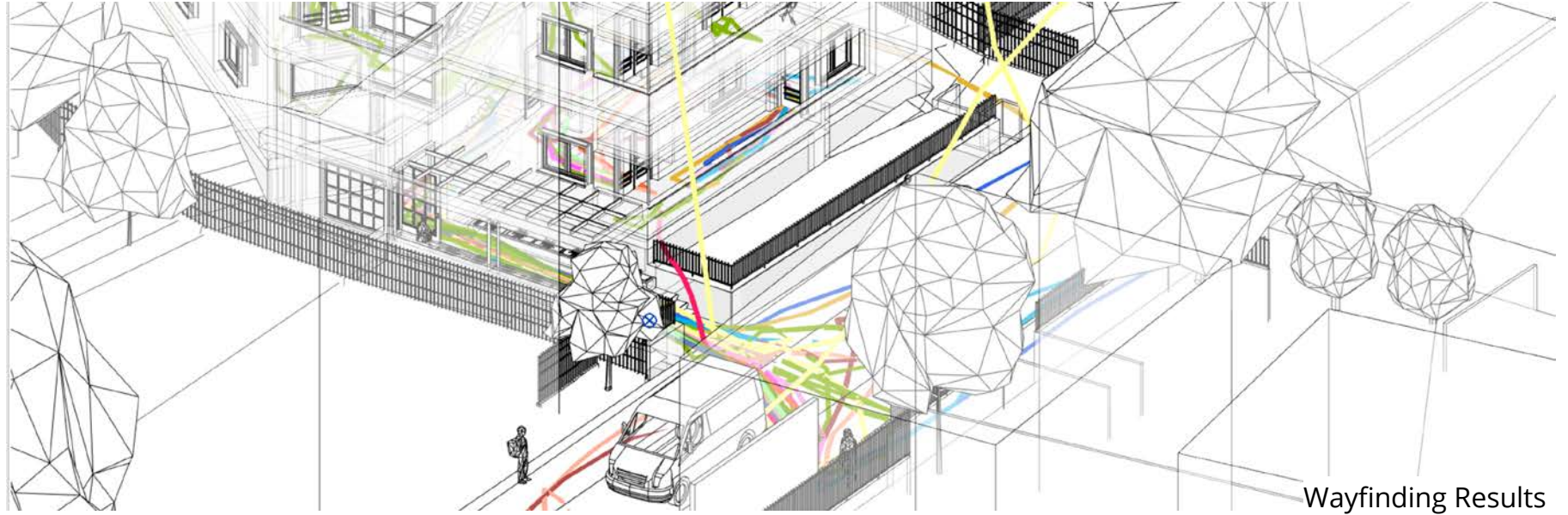
About

The json results will get modified for analysis in different ways.

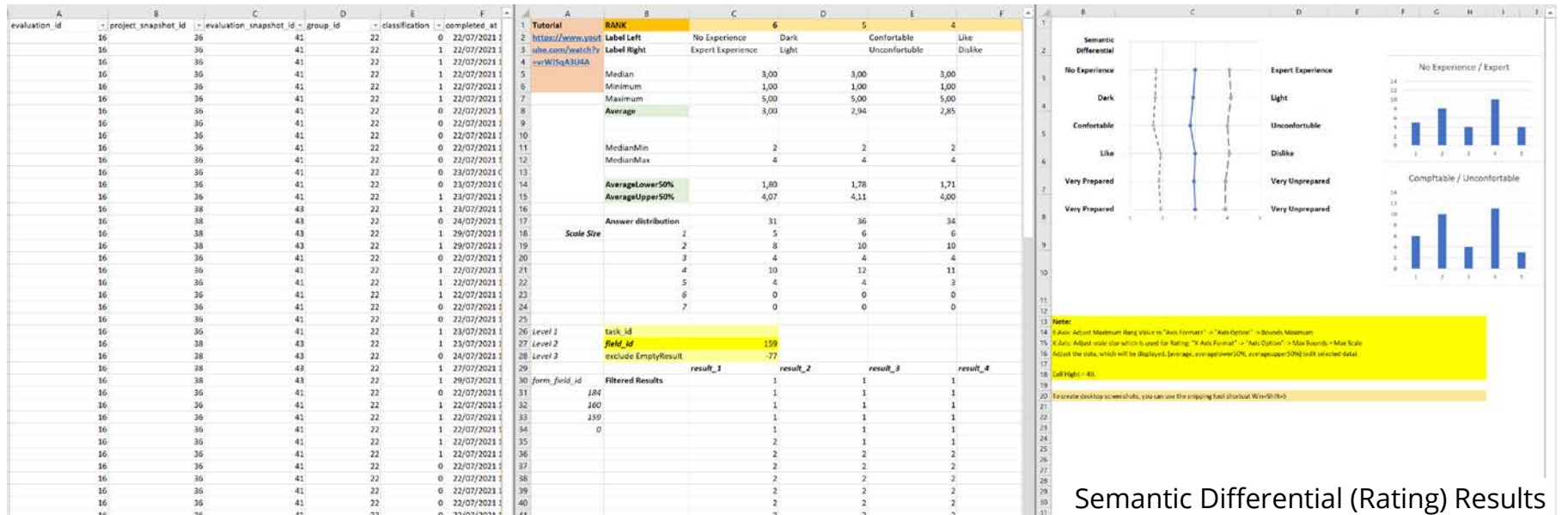
Results will get displayed in *Revit* or transformed to *Table Entries (CSV)*.

Result types, which are saved, are the following:

- Form – Selection *for each task type*
- Form – Rating *for each task type*
- AB-Test
- Wayfinding – Trajectory, start & end point
- Placing – Marker Position
- Annotation – Marker Position and Form results (Selecting / Rating) (identification by UUID)



Wayfinding Results



Semantic Differential (Rating) Results

2. RESULT ANALYSIS

About

The study results can be downloaded from

<https://database.architektur.uni-weimar.de/>

The study results can be found under the participation codes (evaluation is published).

The result file is saved in the format json. Per entry a task is saved.

To get the results displayed in Revit, Dynamo is used.

To analyse the queries, the json file must get translated to a CSV file. The CSV file is created by Dynamo as well. The CSV file can be opened and analysed in Excel.

The results in Revit or CSV Files will be only generated, if the specific family *VREVALResultMarker.rfa* is loaded.

Revit Family

General Family with the following instance parameter:

evaluation_id
project_snapshot_id
evaluation_snapshot_id
group_id
classification
completed_at

playlist_id
playlist_name
scenario_id
scenario_name
task_id
task_name
task_code

participant_id
UUID
sequence_index
checkpoint_name

result_form_field_id
result_results



Marker

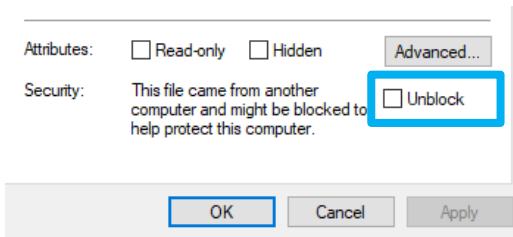
2.1 DYNAMO PACKAGE „VREVAL“

Install

Copy the unzipped VREVAL Package into the Dynamo Package folder.

Don't forget to unblock the Zip File before extracting.

(right click at Zip File -> Properties)



The image shows a Windows Explorer window with the address bar set to 'Roaming > Dynamo > Dynamo Revit > 2.10 > packages >'. The main pane displays a list of folders with columns for 'Name', 'Änderungsdatum', and 'Typ'. The 'VREVAL' folder is selected and highlighted in blue.

Name	Änderungsdatum	Typ
Clockwork for Dynamo 2.x	04/06/2021 00:45	Dateiord
Crumple	18/06/2021 07:27	Dateiord
Genius Loci	04/06/2021 17:32	Dateiord
Spatial Analysis Dynamo 4.6.3	20/05/2021 19:12	Dateiord
spring nodes	04/06/2021 00:49	Dateiord
VREVAL	28/06/2021 10:01	Dateiord

Dynamo Package Folder Structure

E.g.: The package content (Add-on) VREVAL is located in the folder VREVAL

The Dynamo Package has the following structure.

The default package folder is

`%USERPROFILE%\AppData\Roaming\Dyna
mo\Dynamo Revit`

The structure must be maintained.

And navigate to

`\\[DynamoVersion]\packages`

The image shows a Windows Explorer window with the address bar set to 'Dynamo > Dynamo Revit > 2.10 > packages > VREVAL >'. The main pane displays a list of files and folders with columns for 'Name', 'Änderungsdatum', 'Typ', and 'Größe'. The search bar at the top right contains the text '"VREVAL" durchsuc'.

Name	Änderungsdatum	Typ	Größe
bin	28/06/2021 10:01	Dateiordner	
dyf	21/01/2019 12:23	Dateiordner	
extra	21/01/2019 12:23	Dateiordner	
pkg	27/06/2021 21:29	JSON-Datei	1 KB

2.1 DYNAMO PACKAGE „VREVAL“

Filter

Result data can be filtered by:

- Scenario ID
- Playlist ID
- Task ID
- Participant ID
- Field ID
- Result ID
- Sequence ID

To find out more about your data, first run the VREVAL Result Importer once and have a look over it.

Dynamo Player: Filter

The filter works through IDs.
If more than 1 ID is used, the IDs get separated by comma.

Example:
"706,709,712"

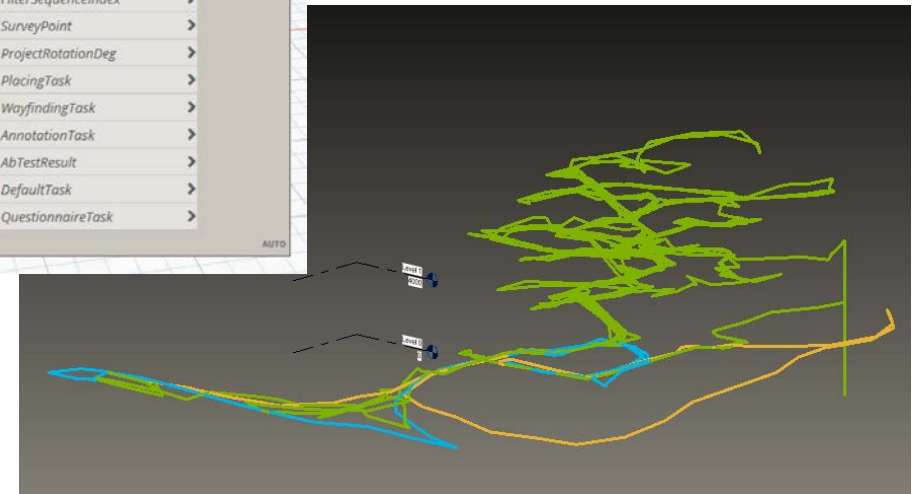
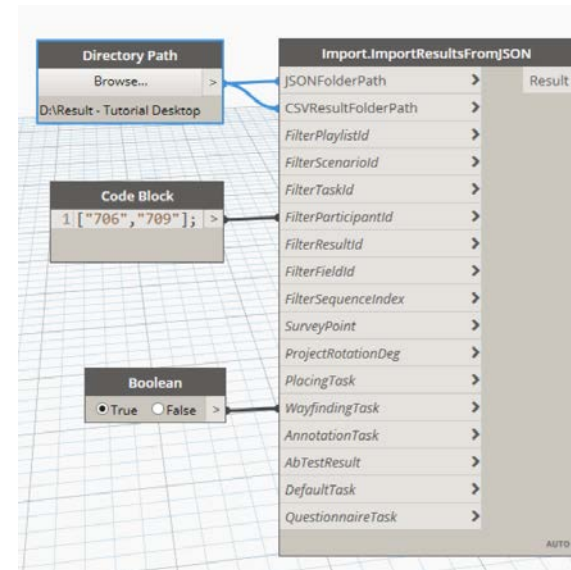
The screenshot shows the 'Wayfinding Results' section of the Dynamo Player interface. It includes a 'Wayfinding Results' toggle switch set to 'True'. Below it are six filter input fields, each with a green checkmark icon to its left. The 'Filter Participant ID' field contains the text '706,709,712'.

- Wayfinding Results : True
- Filter Scenario ID :
- Filter Playlist ID :
- Filter Task ID :
- Filter Participant ID :
- Filter Field ID :

Dynamo Script: Filter

The filter works through IDs.
If more than 1 ID is used, the IDs get separated by comma. The ID must be a "string". The IDs are collecting in a list [].

Example:
["706","709","712"];



2.1 DYNAMO PACKAGE „VREVAL“

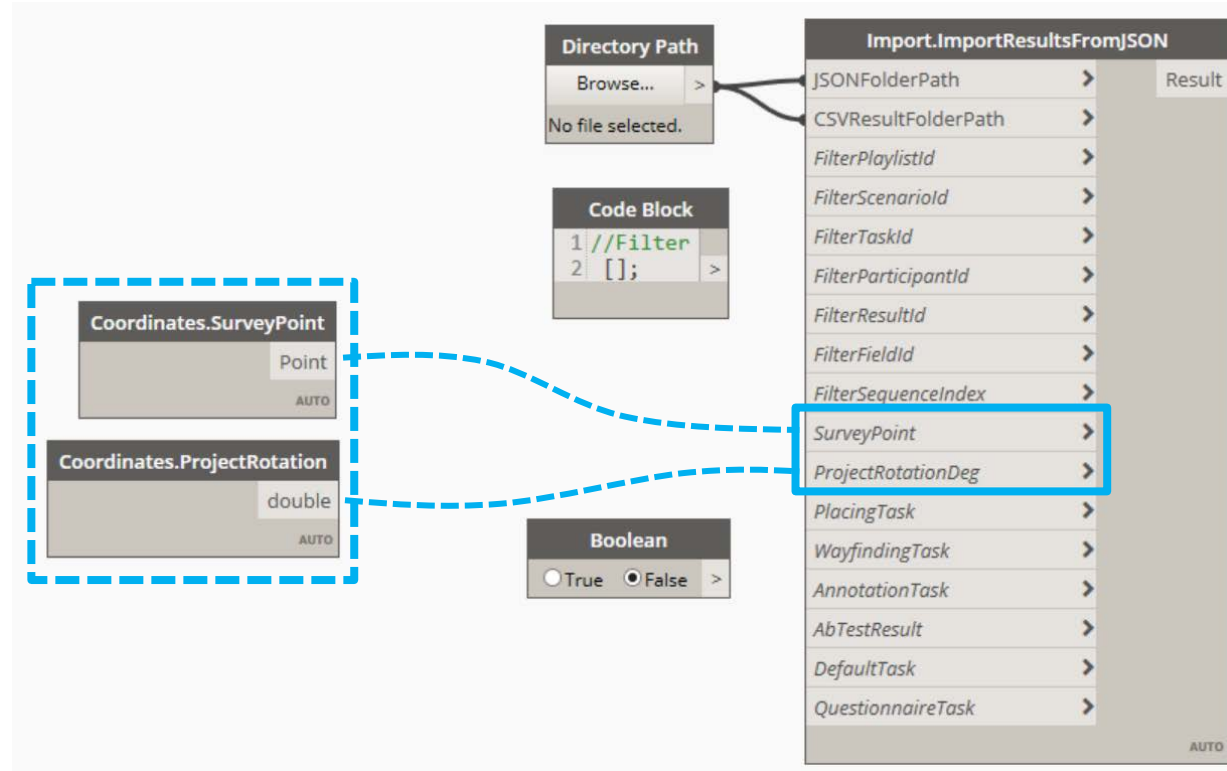
Survey Point & Project Rotation

By **default**, the Survey Point and Project Rotation correction is conducted for Wayfinding, Placing and Annotation Visualizations in Revit.

The Survey Point and Project Rotation gets read out from the json result file.

If a costume correction is required,

- for the survey point the *SurveyPoint* from the Revit File can be extracted or a user defined *Point* can be used.
- For the Project Rotation the *ProjectRotation* of the Revit file can be extracted or a user defined *Number* can be used.



3.1 RESULT ANALYSIS: FORM SELECTING

CSV

The CSV for Selecting is generated by a Dynamo Script (package VREVAL).

Selecting results are saved by each task type (Default, Questionnaire, ABTest, Wayfinding, etc.)

A Excel Template File *VR_Evaluation_Template_Selecting* can be used for predefined analysis. Copy the CSV data into the sheet *Selecting Results*.

The data can be filtered by **task_id** and **form_field_id**.

The diagrams can be modified.

task_id
153
Note: Change the Chard regarding your data input
Tutorial
<https://stackoverflow.com/questions/62204826/excel-unique-across-columns>

form_field_id	153
Unique Results:	
I work / have worked professionally in Architecture or Urban Design	
I have no connection to Architecture or Urban Design	
I am / have studied Architecture or Urban Design in University	
I am not working or studying in Architecture or Urban Design.	
I am currently studying Architecture or Urban Design in University	
I am currently working professionally in Architecture or Urban Design	

Selection	Count	%
I work / have worked professionally in Architecture or Urban Design	8	24%
I have no connection to Architecture or Urban Design	8	24%
I am / have studied Architecture or Urban Design in University	12	35%
I am not working or studying in Architecture or Urban Design.	2	6%
I am currently studying Architecture or Urban Design in University	3	9%
I am currently working professionally in Architecture or Urban Design	1	3%

Unique Form Field Ids

153
156
185

Unique Form Field Ids

33
36
42

Selection	Count
I work / have worked professionally in Architecture or Urban Design	8
I have no connection to Architecture or Urban Design	8
I am / have studied Architecture or Urban Design in University	12
I am not working or studying in Architecture or Urban Design.	2
I am currently studying Architecture or Urban Design in University	3
I am currently working professionally in Architecture or Urban Design	1

Selection	Percentage
I work / have worked professionally in Architecture or Urban Design	24%
I have no connection to Architecture or Urban Design	24%
I am / have studied Architecture or Urban Design in University	35%
I am not working or studying in Architecture or Urban Design.	6%
I am currently studying Architecture or Urban Design in University	9%
I am currently working professionally in Architecture or Urban Design	3%

3.2 RESULT ANALYSIS: FORM RATING

CSV

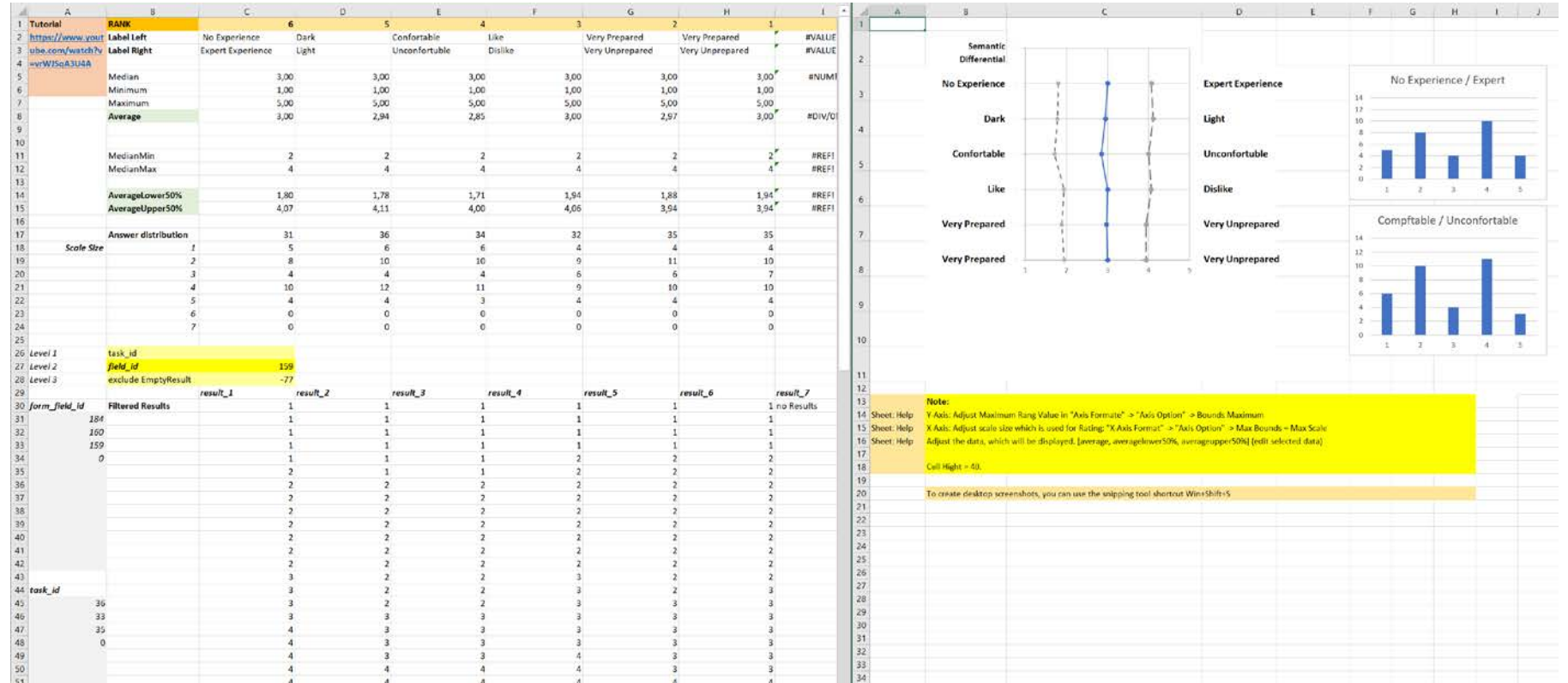
The CSV for Rating is generated by a Dynamo Script (package VREVAL)

Selecting results are saved by each task type (Default, Questionnaire, ABTest, Wayfinding, etc.)

A Excel Template File *VR_Evaluation_Template_Rating* can be used for predefined analysis. Copy the CSV data into the sheet *Rating Results*.

The data can be filtered by **task_id** and **form_field_id** in the sheet Evaluation-Calculation.

The charts can be modified. More charts can be created.



3.3 RESULT ANALYSIS: AB TEST

CSV

The CSV for AB-Test is generated by a Dynamo Script (package VREVAL)

task_id	
sequence_index	2

A Excel Template File *VR_Evaluation_Template_AB* can be used for predefined analysis. Copy the CSV data into the sheet *AB Results*.

The data can be filtered by **task_id** and **sequence_index**.

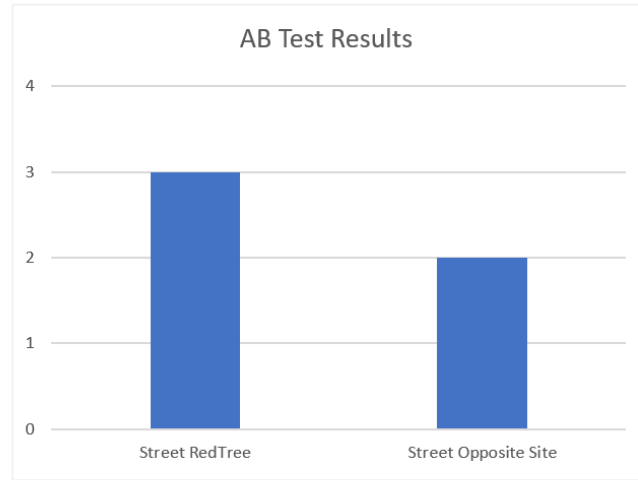
The charts can be modified. More charts can be created.

Unique Results:
Street RedTree
Street Opposite Site

Model Names	Count	%
Street RedTree	3	60%
Street Opposite Site	2	40%

Note: Change the Chard regarding your data input

Filtered Results:
Street RedTree
Street Opposite Site
Street RedTree
Street Opposite Site
Street RedTree



3.4 RESULT ANALYSIS: WAYFINDING

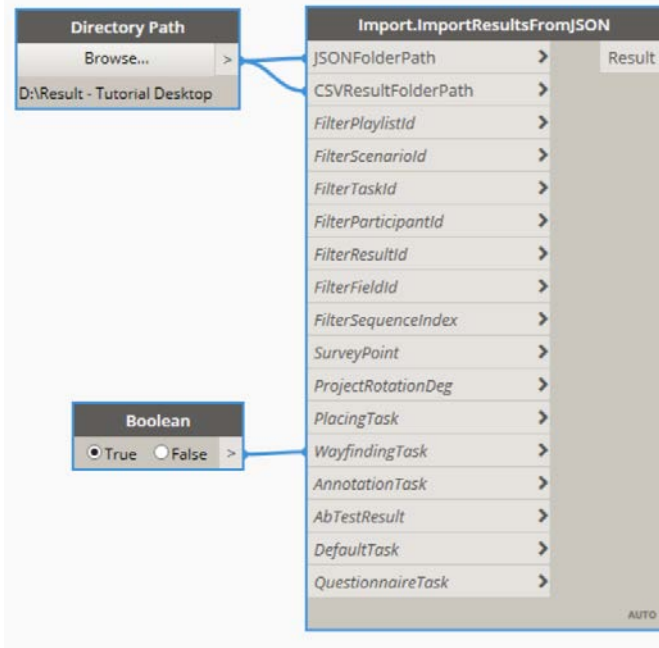
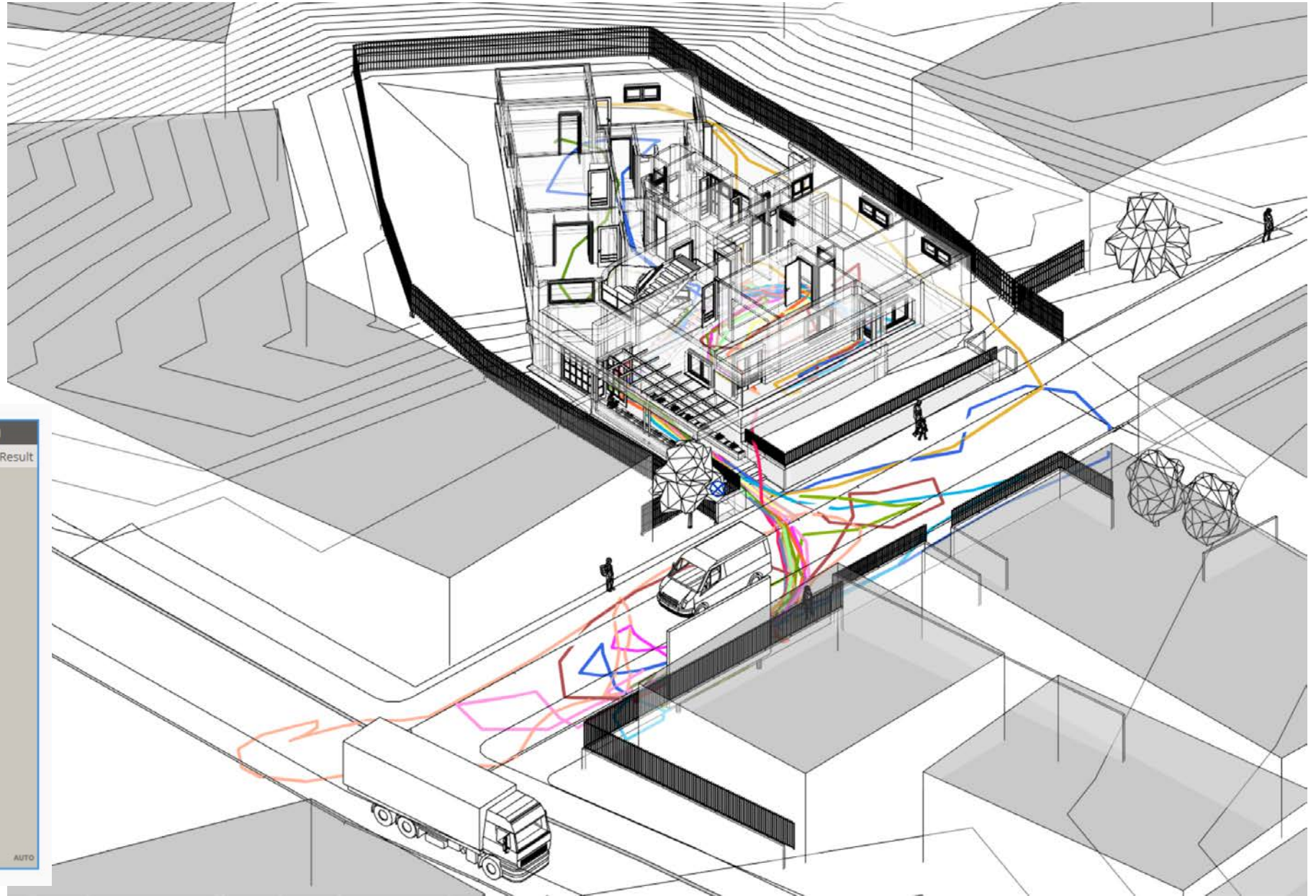
Revit

Wayfinding results are displayed as grouped lines. Per participant an individual colour is used.

With Dynamo more specific analysis like speed and HMD turns can be analysed.

Recommendation

Run the Dynamo script in manual mode.



3.4 RESULT ANALYSIS: WAYFINDING

CSV

Next to the travelled paths, a CSV file can be exported. The CSV file is generated by a Dynamo Script (package VREVAL).

Information about travelled to checkpoints and travel time can be calculated.

A Excel Template File *VR_Evaluation_Template_Wayfinding* can be used for predefined analysis. Copy the CSV data into the sheet *Wayfinding Results*.

The data can be filtered by Task ID.

The analysis tables can be modified.

Start Checkpoint by ID
Task ID 6

Participant ID	Sequence Index			
	0	1	2	3
694	0	87	88	89
712	0	87	88	89
730	0	87	88	89
700	0	87	88	89
714	0	87	88	89
722	0	87	88	89
721	0	87	88	89

Start Checkpoint by Name
Task ID 6

Participant ID	Sequence Index			
	0	1	2	3
694	car	street	tree	entrance
712	car	street	tree	entrance
730	car	street	tree	entrance
700	car	street	tree	entrance
714	car	street	tree	entrance
722	car	street	tree	entrance
721	car	street	tree	entrance

Time from Checkpoint to Checkpoint
Task 4

Participant ID	Sequence Index			
	0	1	2	3
728	00:00:01	00:00:04	00:00:04	00:00:08
727	00:00:15	00:00:38	00:00:26	00:00:32
738	00:00:02	00:00:13	00:00:32	00:00:14
726	00:00:39	00:00:37	00:00:29	00:00:07
709	00:00:07	00:00:04	00:00:08	00:00:16
706	00:00:01	00:00:03	00:00:03	00:00:23
739	00:00:04	00:00:03	00:00:09	00:00:19
715	00:00:06			
719	00:00:01	00:00:37	00:00:03	00:00:19

End Checkpoint by ID

Participant ID	Sequence Index			
	0	1	2	3
694	87	88	89	86
712	87	88	89	86
730	87	88	89	86
700	87	88	89	86
714	87	88	89	86
722	87	88	89	183
721	87	88	89	86

End Checkpoint by Name

Participant ID	Sequence Index			
	0	1	2	3
694	street	tree	entrance	balcony
712	street	tree	entrance	balcony
730	street	tree	entrance	balcony
700	street	tree	entrance	balcony
714	street	tree	entrance	balcony
722	street	tree	entrance	backyard
721	street	tree	entrance	balcony

Start - End Checkpoint by ID

Participant ID	Sequence Index			
	0	1	2	3
694	0 - 87	87 - 88	88 - 89	89 - 86
712	0 - 87	87 - 88	88 - 89	89 - 86
730	0 - 87	87 - 88	88 - 89	89 - 86
700	0 - 87	87 - 88	88 - 89	89 - 86
714	0 - 87	87 - 88	88 - 89	89 - 86
722	0 - 87	87 - 88	88 - 89	89 - 183
721	0 - 87	87 - 88	88 - 89	89 - 86

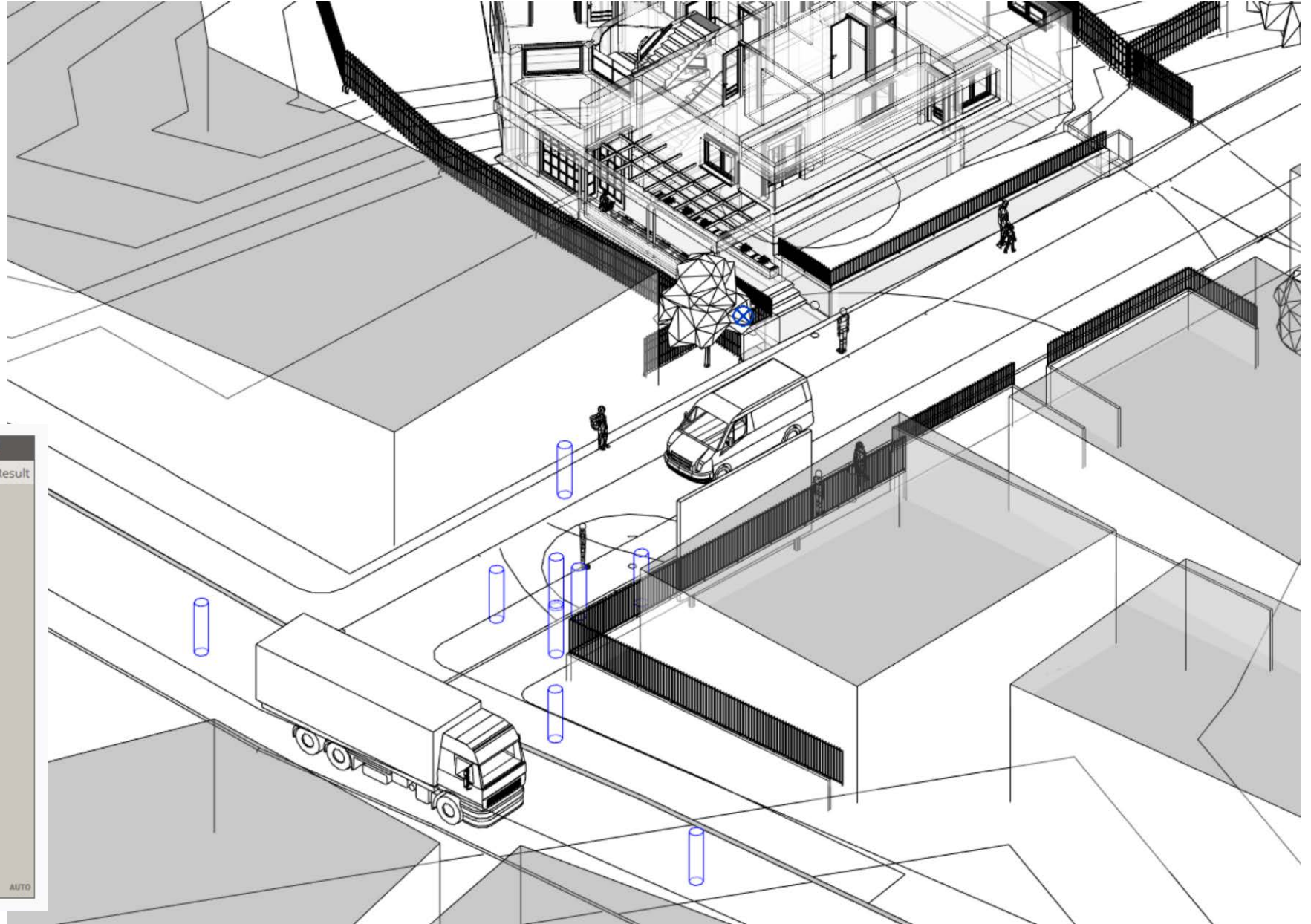
Start - End Checkpoint by Name

Participant ID	Sequence Index			
	0	1	2	3
694	car - street	street - tree	tree - entrance	entrance - balcony
712	car - street	street - tree	tree - entrance	entrance - balcony
730	car - street	street - tree	tree - entrance	entrance - balcony
700	car - street	street - tree	tree - entrance	entrance - balcony
714	car - street	street - tree	tree - entrance	entrance - balcony
722	car - street	street - tree	tree - entrance	entrance - backyard
721	car - street	street - tree	tree - entrance	entrance - balcony

3.5 RESULT ANALYSIS: PLACING

Revit

Placing results are displayed as small pillars. The family VRRResultMarker can be modified.



Recommendation

Run the Dynamo script in manual mode.

Directory Path	Import.ImportResultsFromJSON	Result
Browse... D:\Result - Tutorial Desktop	JSONFolderPath >	
	CSVResultFolderPath >	
	FilterPlaylistId >	
	FilterScenarioId >	
	FilterTaskId >	
	FilterParticipantId >	
	FilterResultId >	
	FilterFieldId >	
	FilterSequenceIndex >	
	SurveyPoint >	
	ProjectRotationDeg >	
Boolean <input checked="" type="radio"/> True <input type="radio"/> False >	PlacingTask >	
	WayfindingTask >	
	AnnotationTask >	
	AbTestResult >	
	DefaultTask >	
	QuestionnaireTask >	

3.6 RESULT ANALYSIS: ANNOTATION

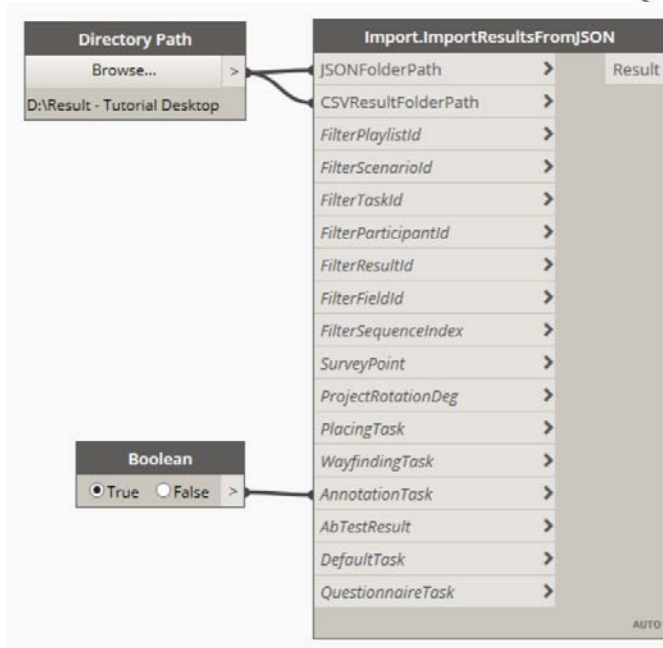
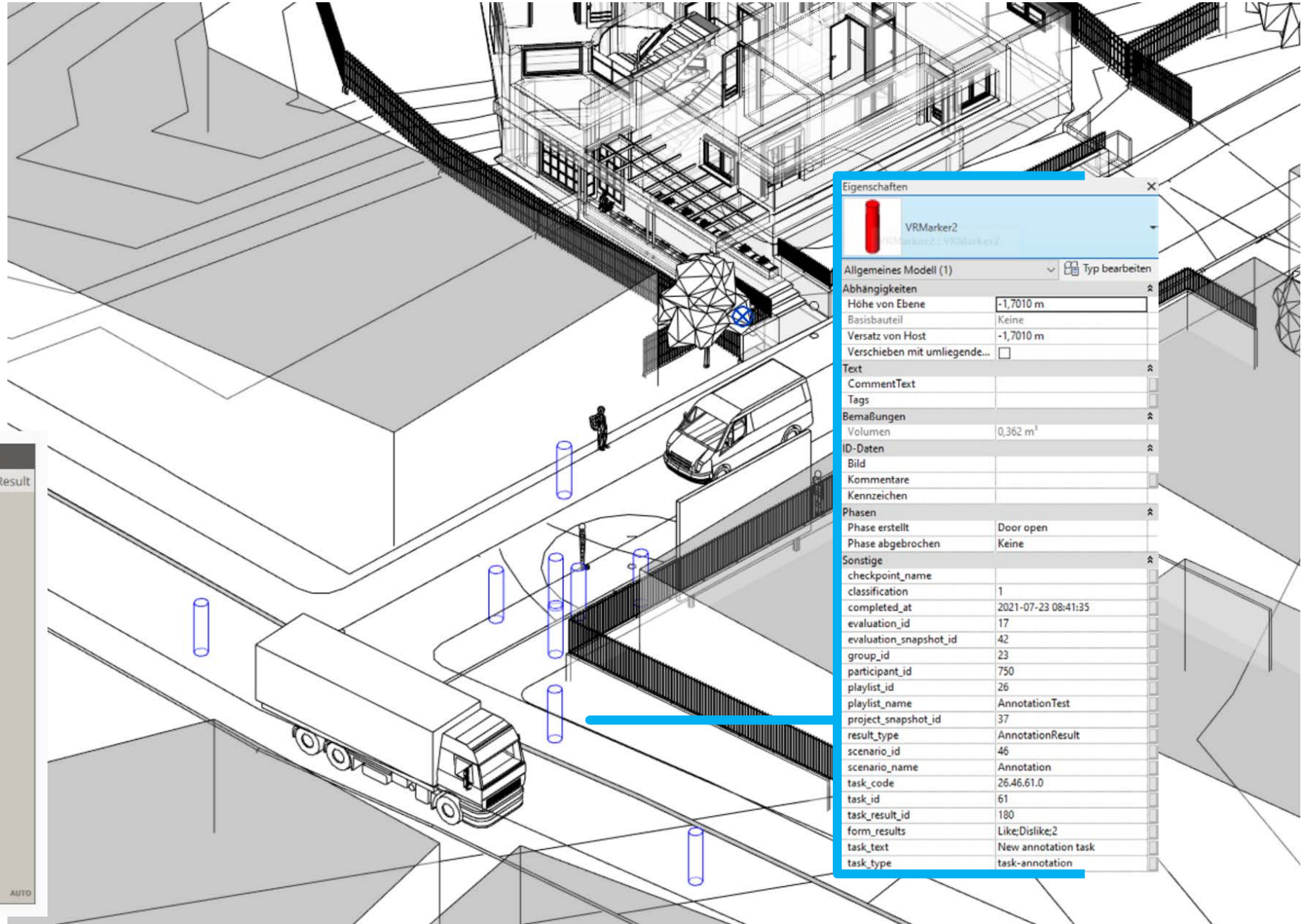
Revit

Annotation results are displayed as small pillars. The family VRRResultMarker can be modified.

For an annotation form-field Selecting or Rating, a CSV file will be created for further analysis.

Recommendation

Run the Dynamo script in manual mode.



Eigenschaften	
VRMarker2	
Allgemeines Modell (1) Typ bearbeiten	
Abhängigkeiten	
Höhe von Ebene	-1,7010 m
Basisbauteil	Keine
Versatz von Host	-1,7010 m
Verschieben mit umliegende...	<input type="checkbox"/>
Text	
CommentText	
Tags	
Bemaßungen	
Volumen	0,362 m ³
ID-Daten	
Bild	
Kommentare	
Kennzeichen	
Phasen	
Phase erstellt	Door open
Phase abgebrochen	Keine
Sonstige	
checkpoint_name	
classification	1
completed_at	2021-07-23 08:41:35
evaluation_id	17
evaluation_snapshot_id	42
group_id	23
participant_id	750
playlist_id	26
playlist_name	AnnotationTest
project_snapshot_id	37
result_type	AnnotationResult
scenario_id	46
scenario_name	Annotation
task_code	26.46.61.0
task_id	61
task_result_id	180
form_results	Like;Dislike;2
task_text	New annotation task
task_type	task-annotation