LECTURE 05.
UI INTERACTIONS IN UIPATH

Robotic Process Automation
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Elective Course, 2023-2024, Fall Semester

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Acknowledgements

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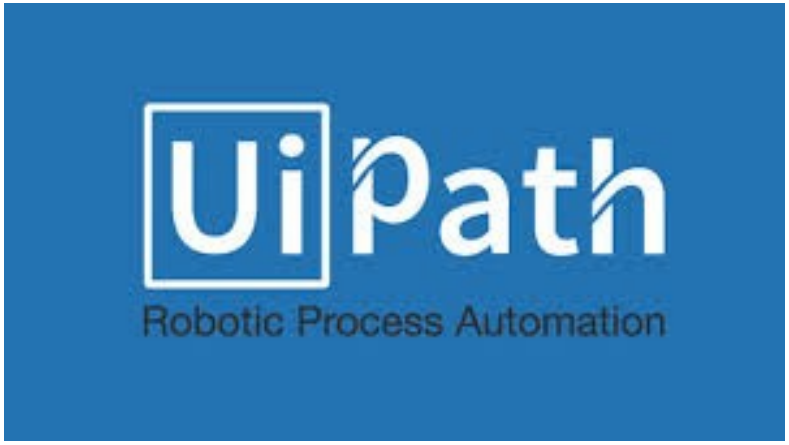


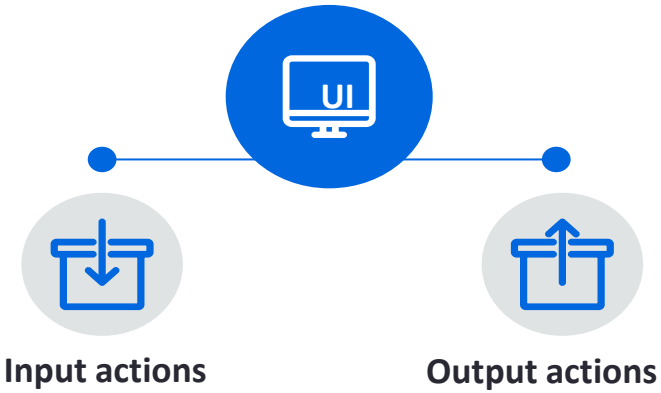
Contents

UI Interactions. Details

- **UI interactions** are
  - the actions performed by a user to interact with the system at user interface level.
- **UI elements** are
  - all graphical user interface pieces that constitute an application;
  - E.g.: windows, check boxes, text fields or drop-down lists.

UI Interactions. Types

- **UI automation** is implemented by using **UI interactions** with **UI Elements** present on user interface level in applications.
- there are two types of **UI interactions** that *can appear in an automation*:
  - **input actions** – to insert data into an application;
  - **output actions** – to read data from an application.



UI Interactions. Types. Operations

- there are two types of **UI interactions** that *can appear in an automation*:
  - **input actions** – to insert data into an application;
  - **output actions** – to read data from an application.

Input Actions

- **Clicks**
- **Text typing**
- **Keyboard shortcuts**
- **Mouse hover**
- **Clipboard actions (Paste)**

Output Actions

- **Getting text**
- **Finding elements**
- **Identifying images**
- **Clipboard actions (Copy)**

Input Actions. Details

- ***input actions*** achieved by *humans*
  - by using **clicks**, **types** and **key combinations**, etc. that correspond in UiPath Studio to the following activities: **Click**, **Type Into**, **Send Hotkey**;
  - **devices used:** the mouse, the keyboard;

- ***input methods*** used by *robots*
  - to replicate the input actions **that simulate the interaction with devices**: mouse, keyboard, OS message sending, etc.;
  - UiPath supports several input methods:
    - **Default;**
    - **Send window messages;**
    - **Simulate Type/Click;**

Input Actions. Types

- ***input actions*** achieved by *humans* correspond to the following activities in UiPath Studio: **Click**, **Type Into**, **Send Hotkey**.

Click	Type Into	Send Hotkey
▪ **Click/Type**: single or double type of click; ▪ **MouseButton**: left, middle or right; ▪ **Timeout**: retry duration; ▪ **Key Modifiers**: Alt, Ctrl and/or Shift;	▪ **Activate**: activate the UI element to be typed into; ▪ **ClickBeforeTyping**: click on the UI element; ▪ **DelayBetweenKeys**: between each typed key; ▪ **EmptyField**: empty the UI element before typing;	▪ **Activate**: activate the UI element to be typed into; ▪ **ClickBeforeTyping**: click on the UI element; ▪ **DelayBetweenKeys**: between each typed key; ▪ **EmptyField**: empty the UI element before typing.

see **Demo1 – InputMethods, Demo2 – ParallelActivity-InputMethods**

UiPath

UiPath Input Methods. Types

- in UiPath there are 3 input methods available:

Default method:

- it replicates the **human method** by capturing the input given while interacting with the UI element of the screen;

Send Window Messages:

- it replicates the **messages that an application receives** when the user utilizes the keyboard and the mouse;

Simulate Type/Click:

- it acts like a developer that programmatically changes the value of an editable field, using **the technology of the target application.**

see **Demo1 – InputMethods, Demo2 – ParallelActivity-InputMethods**

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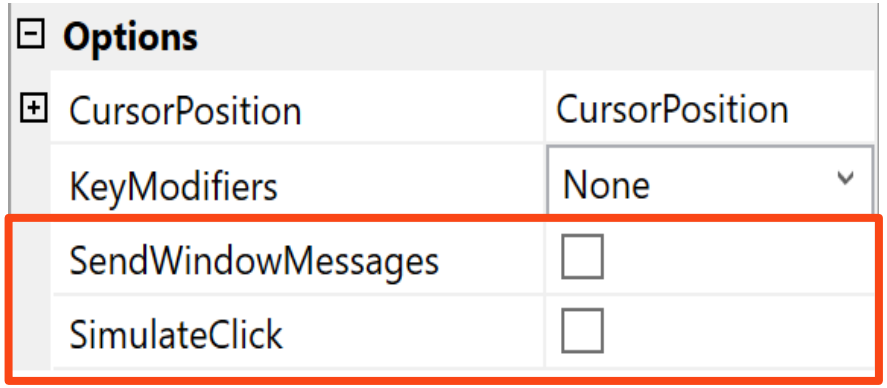
UiPath Input Methods. Default

Working

- **Clicking:** the mouse cursor moves across the screen;
- **Typing:** the keyboard driver is used to type individual characters;
- no check box is selected ==> the **Default** method



Implications

- the user cannot touch the mouse or keyboard during the automation (**the window must be active** and on top of others);
- it has **a lower speed** and load times can impact accuracy.

Strong points

Supports special keys like **Enter**, **Tab**, and other **hotkeys**;

Limitations

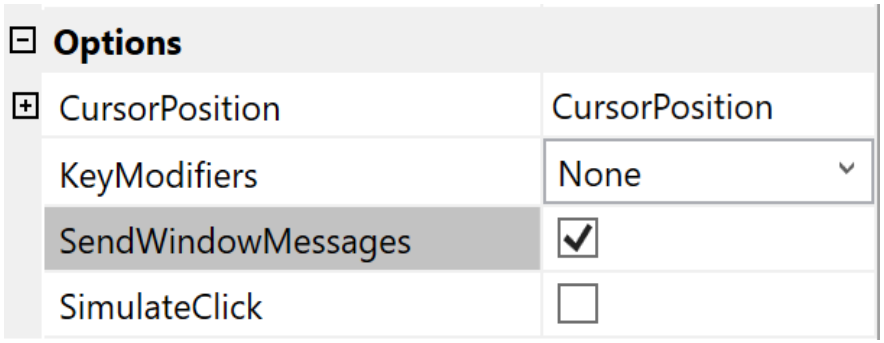
- **it does not automatically erase previously written text;**
- **it does not work in the background.**

see **Demo1 – InputMethods, Demo2 – ParallelActivity-InputMethods**

UiPath Input Methods. Send Window Messages

Working

- it replays the window messages that the target application receives when the mouse/keyboard is used;
- **Clicking** and **typing** occur instantly;



Implications

- **it works in the background;**
- it is comparable to the **Default** method in terms of speed;

Strong points

- Supports special keys like **Enter**, **Tab**, and other **hotkeys**;
- **Users can work on other activities during the execution of the automated processes;**

Limitations

- **Does not automatically erase previously written text;**
- **it works only with applications that respond to Window Messages**.

see **Demo1 – InputMethods, Demo2 – ParallelActivity-InputMethods**

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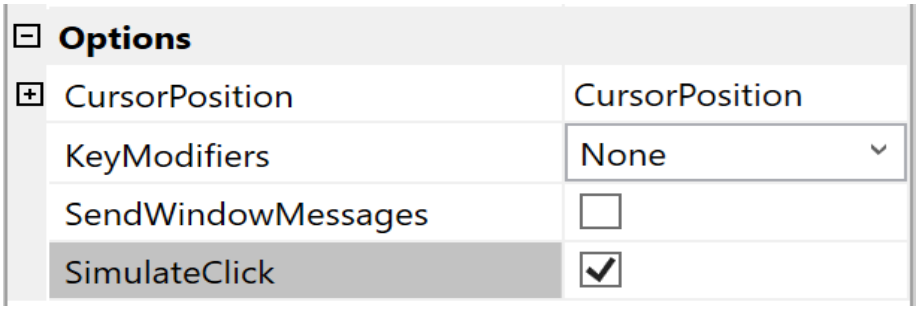
UiPath Input Methods. Simulate Type/Click

Working

- it uses the technology of the target application to send instructions;
- **Clicking** and **typing** occur instantly;



Implications

- **it works in the background;**
- **actions are a lot faster**, but there are some compatibility limitations;

Strong points

- **it can automatically erase previously written text;**
- **Users can work on other activities during the execution of the automated processes;**

Limitations

- **it does not support special keys like Enter, Tab, and other hotkeys;**
- **it has a lower compatibility than the other 2 methods.**

see **Demo1 – InputMethods, Demo2 – ParallelActivity-InputMethods**

Demo 1. Input Methods Applied

- **Create the following workflow:**
  - **1. o*pen* the Notepad Application;**
  - **2. *type* "Happy Monday!";**
  - **3. *minimize* the Notepad window;**
  - **4. *restore* the Notepad window;**
  - ***5. type* "This was sent on Monday.";**

- **Perform the following tasks:**
  - **Add steps similar to steps 4 and 5 for other input methods;**
  - **Discuss the followings:**
    - ***Is the field blank?***
    - ***Are hotkeys handled correctly?***
    - ***How fast does the automation work?***
    - ***Does the automation work in background or just in foreground?***

see **Demo1 – InputMethods**

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Demo 2. Parallel Activity and Input Methods

- **Create a workflow that opens three files in parallel;**
  - **1. *open* the Notepad Application;**
  - **2. *types in***
    - "Twinkle, twinkle, little star,
    - How I wonder what you are!
    - Up above the world so high,
    - Like a diamond in the sky.
    - Twinkle, twinkle, little star,
    - How I wonder what you are!"
  - **3. *minimizes* the Notepad window;**
  - **4. *restores* the Notepad window;**
  - **5. *saves* the file;**
  - **6. *closes* the file.**
- **Emphasize the use of different input methods:**
  - **Default;**
  - **Send window messages;**
  - **Simulate Type/Click.**

see **Demo2 – ParallelActivity-InputMethods**

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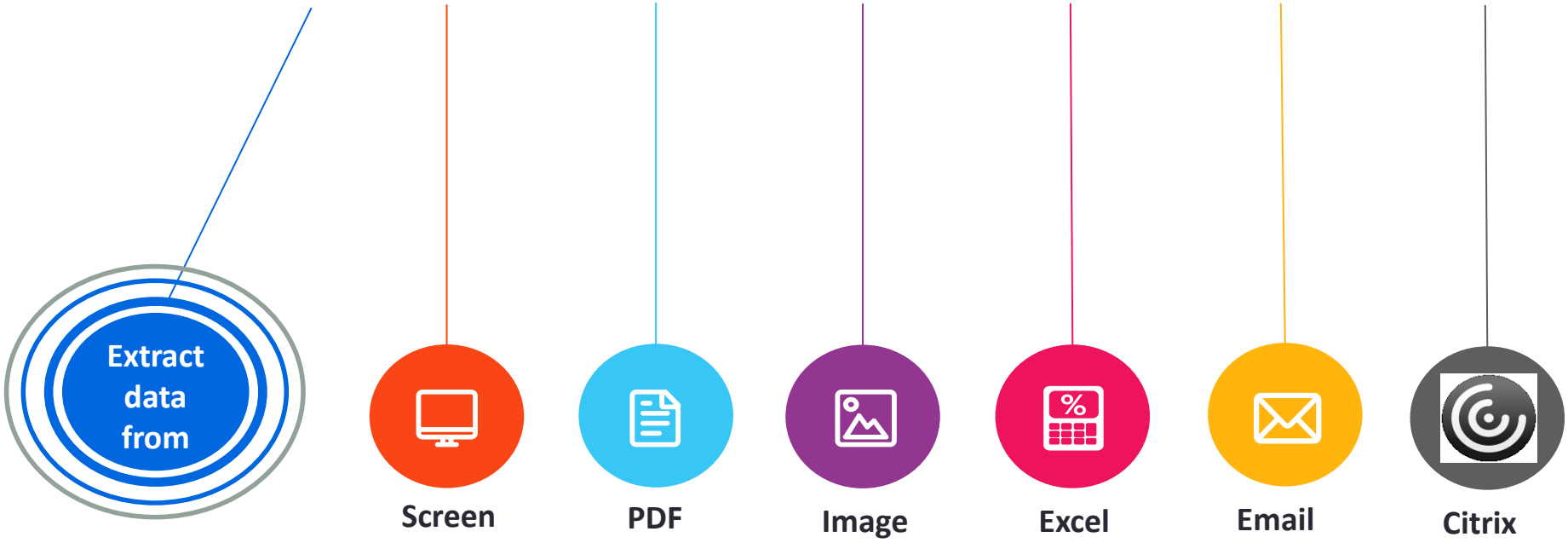
UiPath Input Methods. Summary

- input methods available in UiPath:

	Compatibility	Background	Speed	Hotkeys	Empty Field
Default	100%	NO	50%	YES	NO
Window Messages	80%	YES	50%	YES	NO
Simulate Type/Click	99% (for Web Apps) 60% (for Desktop Apps)	YES	100%	NO	YES

Information Extraction. Details

- **information extraction**:
  - the process of retrieving data from a data source for further processing or storage;
- based on the data source, there are several types of information extraction covered in UiPath:



UI Output Methods. Details

- for *humans:*
  - **output action** are **read** and **process** the data resulted from *applications* and *files*;
- for *robots:*
  - there are different ways to present **output actions**;
    - **activities** that simulate **output actions** and use *variables* and *arguments* to extract:
      - **text: Get Text**, **Get Full Text**, **Get Visible Text**, **Get OCR Text** activities;
      - **UI elements attributes: Get Ancestor**, **Get Attributes**, **Get Position** attributes.
    - **tools** that **simulate data reading** from *screens* and *documents*;
      - they enable **data extraction** from UI elements when the automation workflows interact with;
      - extraction techniques:
        - **Screen scraping** – UiPath supports 3 output methods:
          - **Full Text, Native, OCR;**
        - **Data scraping** – structured data in **DataTable** variables;
        - PDF, etc.

see **Demo3 – ScreenScraping-OutputMethods, Demo4-DataScraping**

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UI Output Actions. Details

- there several activities associated to output actions:

Get Text
Extracts a **text value** from a specified UI element

Get Full Text
Extracts a string and its information from an indicated UI element using the **FullText** screen scraping method

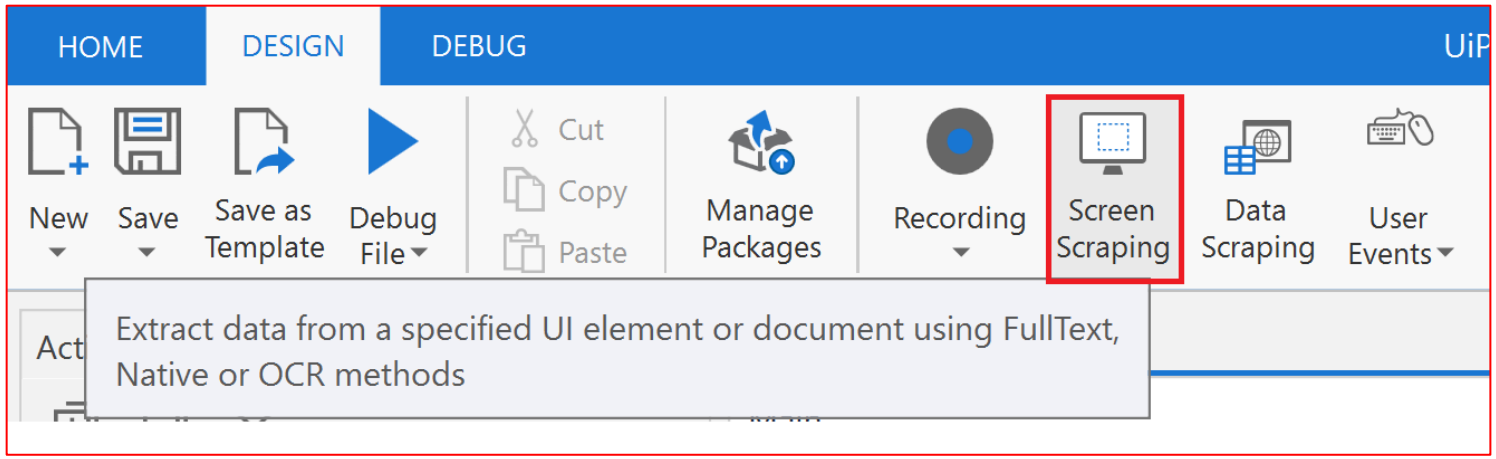
Get Visible Text
Extracts a string and its information from an indicated UI element using the **Native** screen scraping method

Get OCR Text
Extracts a string and its information from an indicated UI element using the **OCR** screen scraping method

see **Demo3 – ScreenScraping-OutputMethods**

Screen Scraping Wizard. Details

- the **Screen Scraping Wizard** enables:
  - **to point** at a UI element and
  - **to extract text** from it, using one of the **three output methods (FullText, Native, OCR)**;
- the steps to perform screen scraping are:
  - 1. start the Screen Scraping Wizard;
  - 2. select the UI element in Computer Vision mode;
  - 3. select the screen scraping method from the options panel;
  - *(optional)* 4. if required, switch to another output method that gets the needed results.



see **Demo3 – ScreenScraping-OutputMethods**

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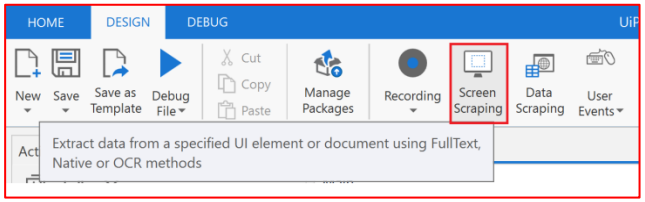
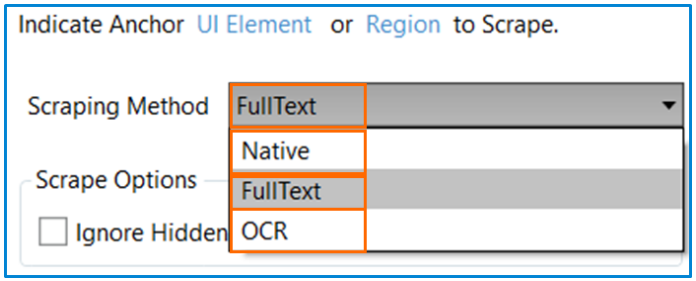
Screen Scraping Wizard. Steps

- Steps:
  - 1. the **Screen Scraping Wizard** is started from the **Design Ribbon** in UiPath Studio.
  - 2. the screen goes in *Computer Vision mode*, highlighting the UI elements that it identifies with blue;
    - select the UI element;
    - UiPath Studio *automatically* choses a screen scraping method;
  - 3. after it finishes extracting the text, the wizard shows the outcome;
    - the user is allowed to switch between the 3 output methods and customize using the available properties;
    - the **Refresh** button can be used to see the outcome according to the new settings.





see **Demo3 – ScreenScraping-OutputMethods**

Screen Scraping Methods. Types

- in UiPath there are 3 output methods when screen scraping:

FullText method:

- **it is the default output method in most cases;**
- **it is the fastest method, has 100% accuracy** and **can work in the background;**

Native method:

- **it is compatible with applications that use the Graphics Design Interface and Microsoft API responsible for representing graphical object;**
- **it can extract the text position (coordinates)** and **formatting; it has 100% accuracy;**

OCR (Optical Character Recognition) method:

- **it is the only one that works with Citrix;**
- **its technology relies on recognizing each character just like we recognize faces in a photography;**

see **Demo3 – ScreenScraping-OutputMethods**

UiPath

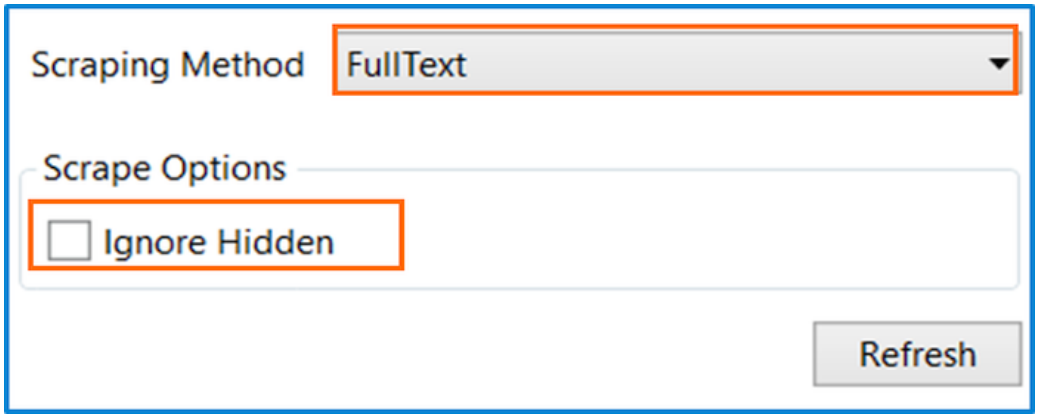
FullText Method. Details

FullText method:

- **it is the default output method in most cases;**
- **it is the fastest method, has 100% accuracy** and **can work in the background;**
- it is able to extract hidden text (for example, options in a drop-down list);
- **it doesn't support Citrix and doesn't capture text position and formatting;**
- captures all the text from a terminal screen.

Ignore Hidden:

- when this check box is selected, the hidden text from the selected UI Element is not copied.



see **Demo3 – ScreenScraping-OutputMethods**

Native Method. Details

Native method:

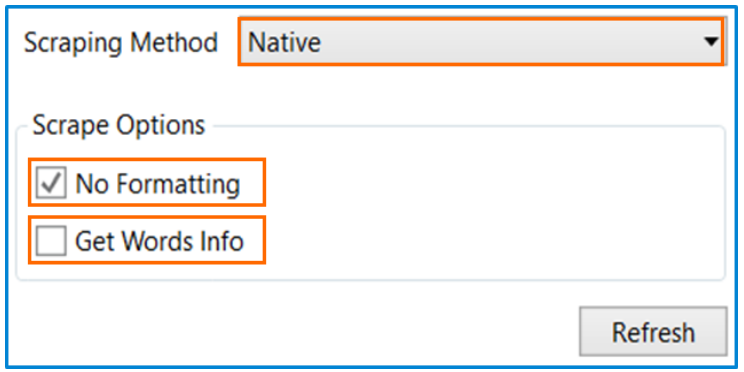
- **it is compatible with applications that use the Graphics Design Interface;**
- **it can extract the text position (coordinates)** and **formatting;**
- **it has 100% accuracy;**
- **its speed is lower than FullText method** and **it cannot work in the background**;
- **like FullText method, it doesn't support Citrix.**

No Formatting:

- when this check box is selected, the copied text does **not** extract formatting information from the text, i.e., font, color, similar to **FullText** method;

Get Words Info:

- when this check box is selected, the screen coordinates of each word are extracted;
- it supports several separators; if the **Custom Separator** field is empty all kwon separators are used.



see **Demo3 – ScreenScraping-OutputMethods**

UiPath

OCR Method. Details

- the **OCR output method**
  - uses the OCR technology (**Optical Character Recognition**) for:
    - extracting information from virtual environments (Citrix or Remote Desktop);
    - "reading" text from images;
  - **it attempts to recognize each letter or given image in the target document;**

OCR (Optical Character Recognition) method:

- **it is the only one that works with Citrix;**
- **its technology relies on recognizing each character just like we recognize faces in a photography;**
- **like Native method, it also captures the text position;**
- **it cannot work in the background, cannot extract hidden text, and its speed is by far the lowest;**
- its accuracy varies from one text to another, and changing settings can also improve the results.

see **Demo3 – ScreenScraping-OutputMethods**

UiPath

OCR Method. Engines

- it has two default engines:
  - **Google Tesseract OCR**;
  - **UiPath Screen OCR**

	Multiple Languages Support	Preferred Area Size	Support for Color Inversion	Filter Allowed Characters	Best with Microsoft Fonts
Google Tesseract	Can be added	Small	YES	YES	NO
UiPath Screen OCR	API Key	Large			

see **Demo3 – ScreenScraping-OutputMethods**

Google Tesseract OCR Engine. Details (1)

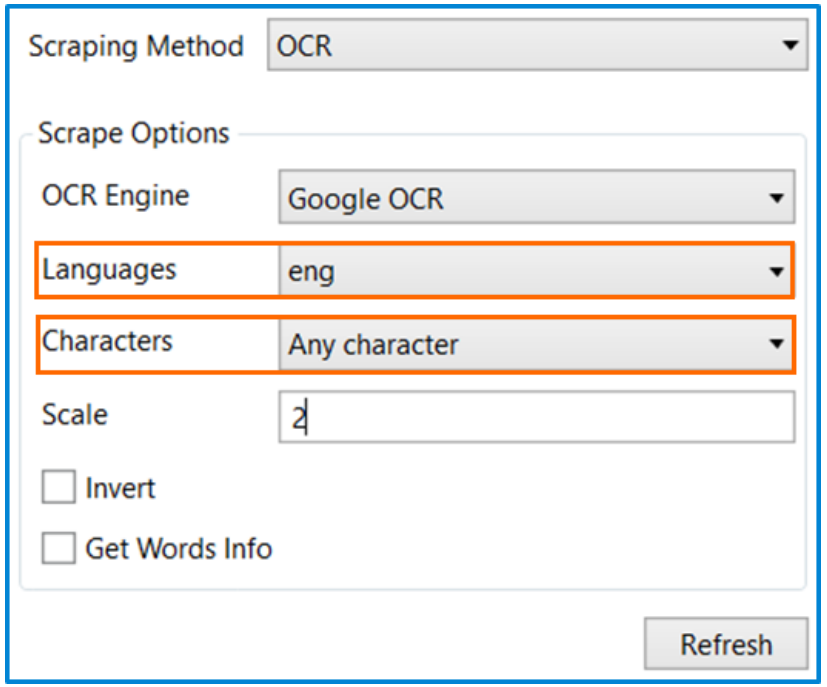
- the **Google Tesseract OCR** engine
  - is more effective with **character recognition** in **small size areas**;
  - it offers **multiple customization** options.

Languages:

- it enables language change for the scraped text;
- by default, English is selected; others are available at https://github.com/tesseract-ocr/tessdata;
- downloaded and copied it in the 'tessdata' subfolder of the UiPath installation folder;

Characters:

- it enables the selection of type of characters to be extracted: any character, numbers only, letters, uppercase, lowercase, phone numbers, currency, date and custom;
- **Custom** option two additional fields, **Allowed** and **Denied**, which allow the user to choose which types of characters to scrape and which to avoid.



see **Demo3 – ScreenScraping-OutputMethods**

UiPath

Google Tesseract OCR Engine. Details (2)

Scale:

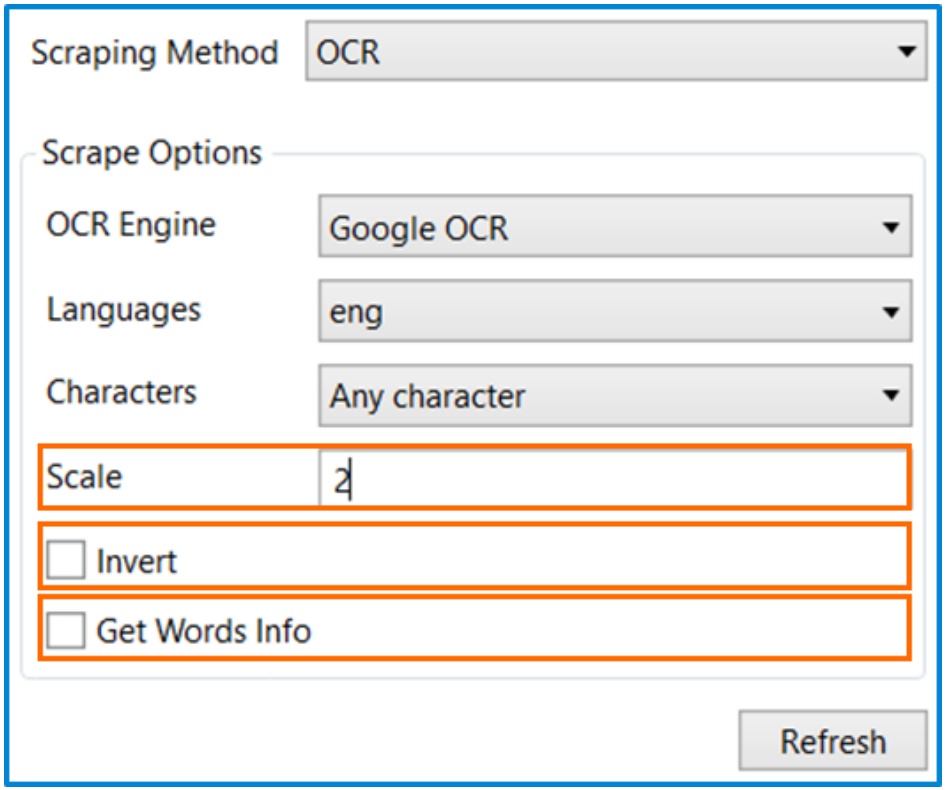
- it helps the user specify the scale of the text to be scraped;
- the higher the number is, the more enlarged is the image – providing a better OCR read and it is recommended with small images;

Invert:

- when this check box is selected, the colors of the UI element are inverted before scraping;
- useful for: **darker themed applications**, **websites** and **scanned documents;**

Get Words Info:

- it gets the on-screen position of each scraped word.



see **Demo3 – ScreenScraping-OutputMethods**

UiPath

Screen Scraping Methods. Summary

- in UiPath there are 3 output methods when screen scraping:

	Speed	Accuracy	Background	Extract Text Position	Extracts Hidden Text	Supports Citrix
FullText	10/10	100%	YES	NO	YES	NO
Native	8/10	100%	NO	YES	NO	NO
OCR	3/10	98%	NO	YES	NO	YES

see **Demo3 – ScreenScraping-OutputMethods**

Screen Scraping. Output Methods. Activity Overview

- the activities associated to the output methods are presented below;

Output Method	Manual action/Activity
Basic Recording	**Get Text** activity
FullText	**Get Full Text** activity
Native	**Get Visible Text** activity
OCR	**Get OCR Text** activity

see **Demo3 – ScreenScraping-OutputMethods**

Demo 3. Screen Scraping Output Methods

- Use Screen Scraping Wizard to take out data from:
  - a .txt file open in Notepad and having the following content:
    - 1. “Flow Chart” and “Assign” activity.
    - 2. “Write Line” and “Do While”.
    - 3. “Sequence” and “Input Dialog” activity.
    - 4. “If” activity and how to set conditions.
    - 5. Display output in “Message Box”.
  - a folder content from a Total Commander application window;
  - the www.cs.ubbcluj.ro web page opened in Chrome browser
    - an image, a text;
    - (https://docs.uipath.com/installation-and-upgrade/docs/studio-extension-for-chrome)
  - the www.imdb.com web page opened in Chrome browser;
  - The IrfanVIewer application with an image that contains the text “*şi a mers cale lungă. Ţintea vizuina monstrului numaidecât.*“

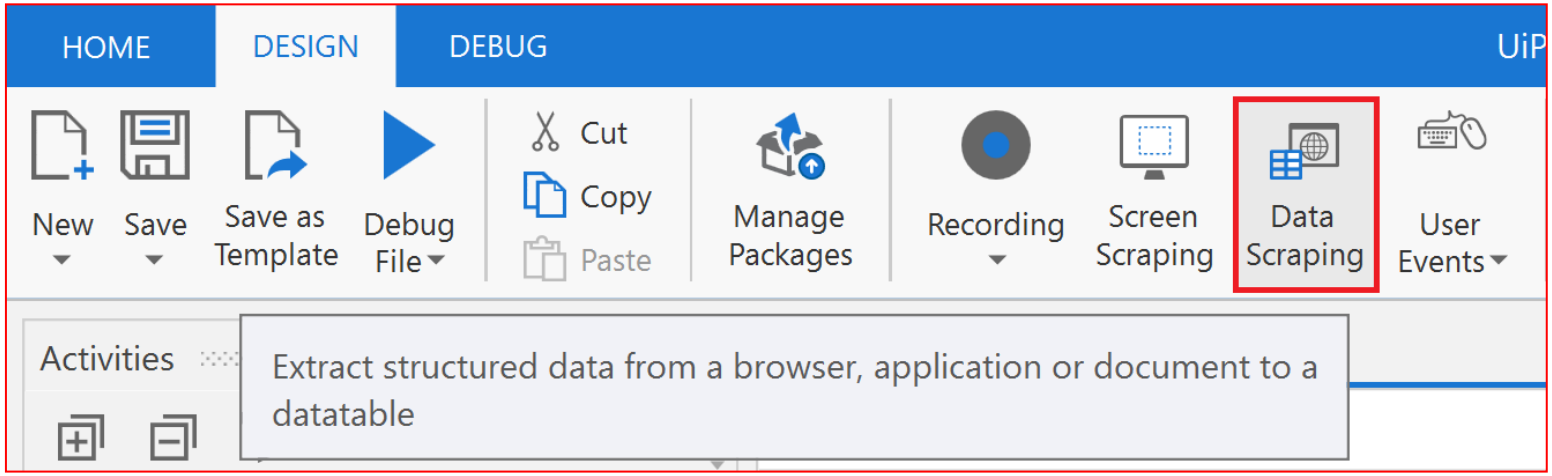
- Perform the following tasks: *Switch between output methods and their options.*

see **Demo3 – ScreenScraping-OutputMethods**

UiPath

Data Scraping. Details

- **Data Scraping** is the **process of extracting structured data**
  - from a **browser, application, or document**
  - to a **database, .csv file,** or **Excel spreadsheet**;
- **Data Scraping** is a functionality of UiPath Studio for extracting structured information and storing it in a **DataTable** variable.



see **Demo4 – DataScraping**

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Structured Data. Details

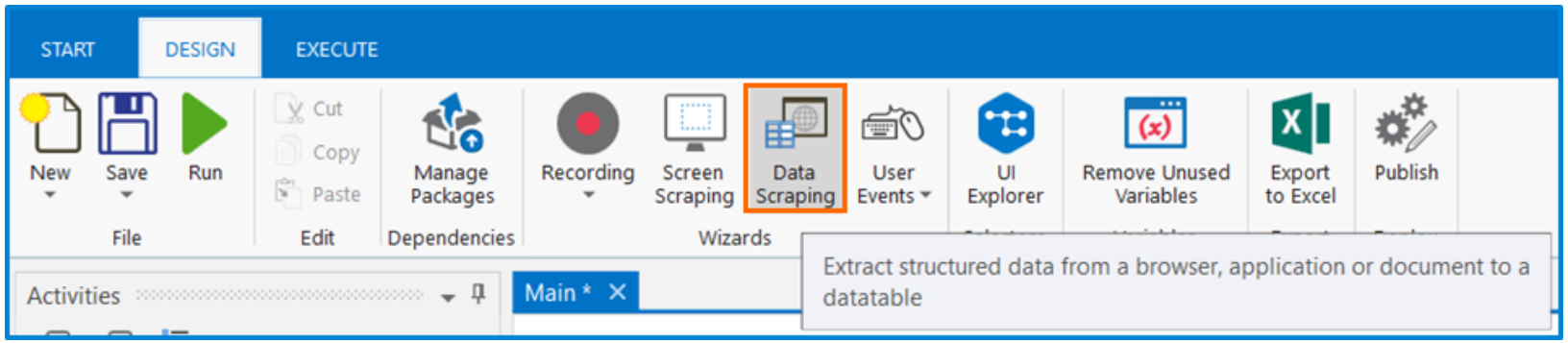
- **Structured data**
  - is a specific kind of information that is **highly organized** and is presented in a **predictable pattern**.

- For example, **Announcements** page available on www.cs.ubbcluj.ro consists of a list of elements having the same structure:
  - a title;
  - a date;
  - a content.

see **Demo4 – DataScraping**

Extract Wizard. Details

- **Extract Wizard** consists of the following steps:
  - 1. Wizard opening;
  - 2. Field selection;
  - 3. Column naming;
  - 4. Pattern preview;
  - 5. Correlated data (where steps 2-->5 repeat as needed);
  - 6. Multiple page selection;
  - 7. Extraction of results.

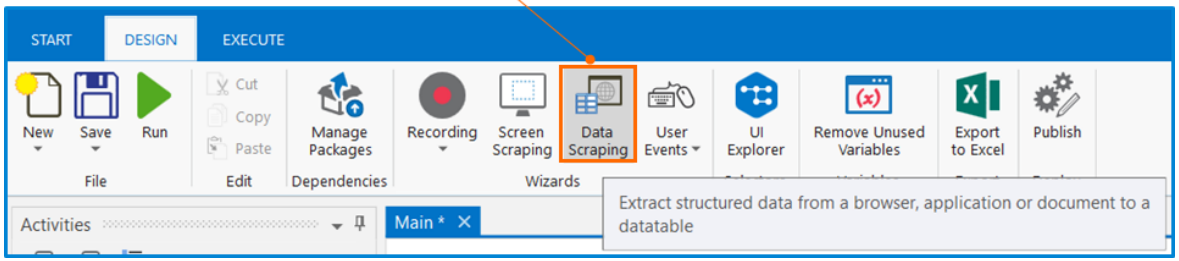


see **Demo4 – DataScraping**

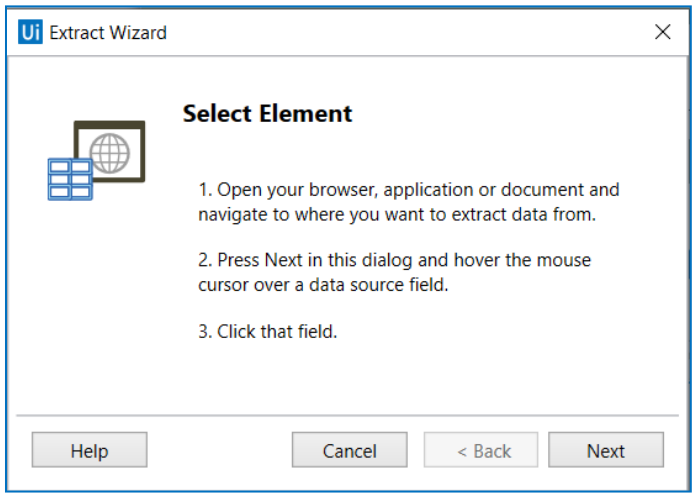
UiPath

Extract Wizard. Step 1

Wizard opening → **Field selection** → **Column naming** → **Pattern preview** → **Correlated data** → **Multiple page selection** → **Extraction of results**



- the **Extract Wizard** window prompts the user to open the browser, application or document to scrape data from
- after 'Next' button is clicked, the screen enters in the *Computer Vision mode*, where each UI element that is identified is shown in **a blue screen with a yellow frame**.

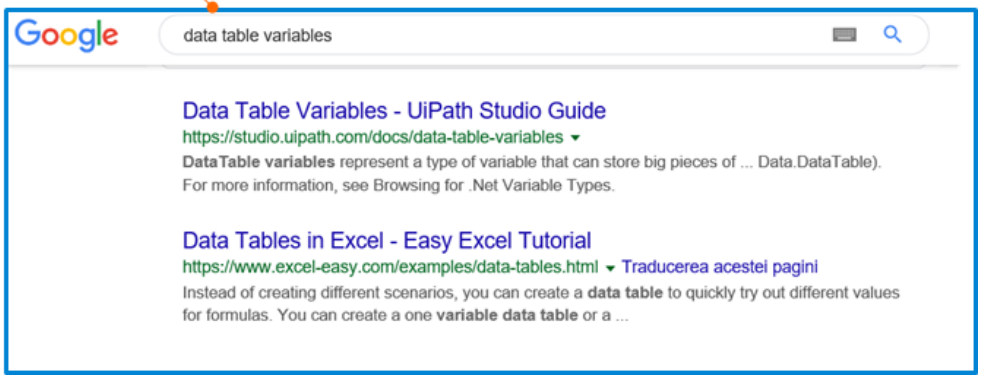


see **Demo4 – DataScraping**

UiPath

Extract Wizard. Step 2

Wizard opening → **Field selection** → Column naming → Pattern preview → Correlated data → Multiple page selection → Extraction of results



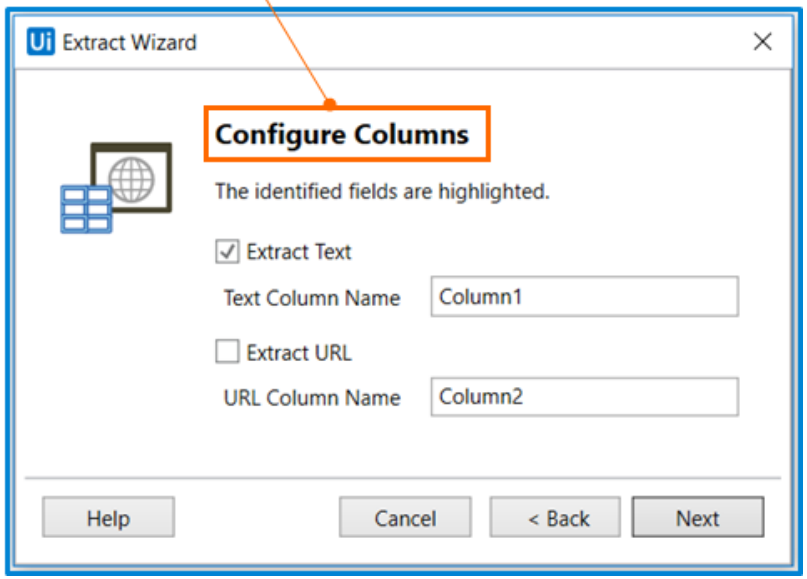
- the user selects the **first entry** and **last entry of the field** in the web page, document, or application that they want to extract data from.

see **Demo4 – DataScraping**

UiPath

Extract Wizard. Step 3

Wizard opening | Field selection | **Column naming** | Pattern preview | Correlated data | Multiple page selection | Extraction of results



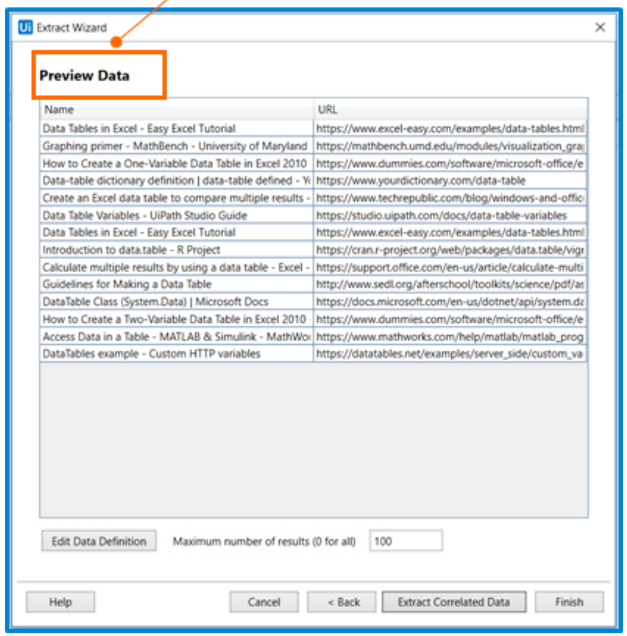
- the user can customize **column header names** and **choose whether or not to extract URLs**.

see **Demo4 – DataScraping**

UiPath

Extract Wizard. Step 4

Wizard opening → Field selection → Column naming → **Pattern preview** → Correlated data → Multiple page selection → Extraction of results

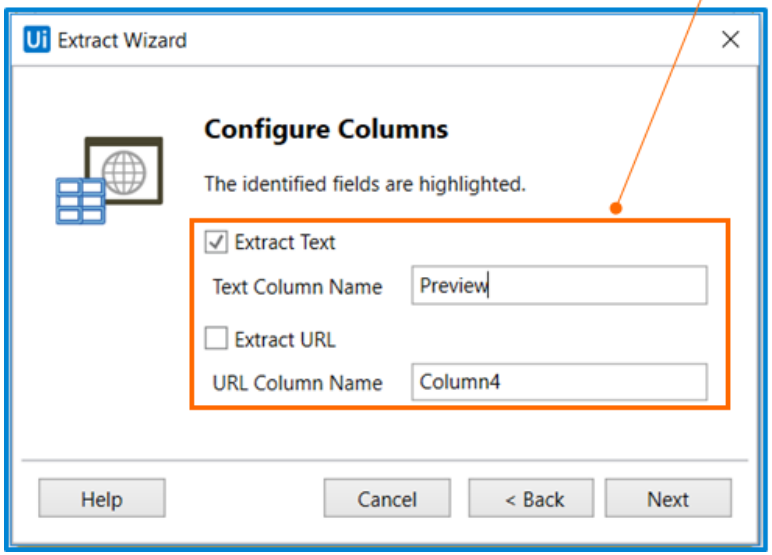


see **Demo4 – DataScraping**

- after the 'Next' button is clicked, a preview of the data is shown, and the user may change the **order of the columns** and **specify the maximum number of entries to be extracted** (default = 100, 0 means extracting all the available the results).

Extract Wizard. Step 5

Wizard opening | Field selection | Column naming | Pattern preview | **Correlated data** | Multiple page selection | Extraction of results

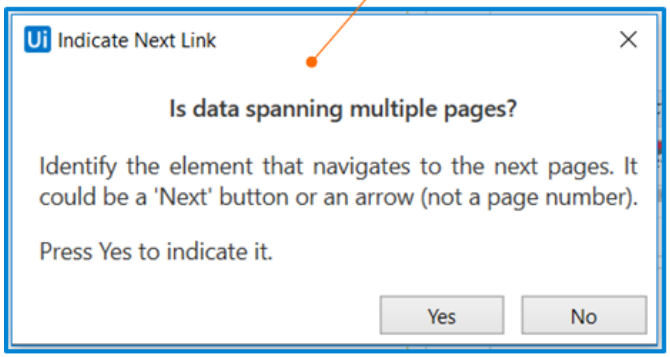


- this is particularly useful when the user wants to extract multiple fields;
- after each field is indicated, the user can add the name of the column;
- the operation of **extracting correlated data can be repeated multiple times**.

see **Demo4 – DataScraping**

Extract Wizard. Step 6

Wizard opening → Field selection → Column naming → Pattern preview → Correlated data → **Multiple page selection** → Extraction of results



- after the 'Next' button is clicked, the wizard asks whether the **data spans on multiple pages**, and if so, the user needs to point out the **next button** ***(not the number of the next page).***

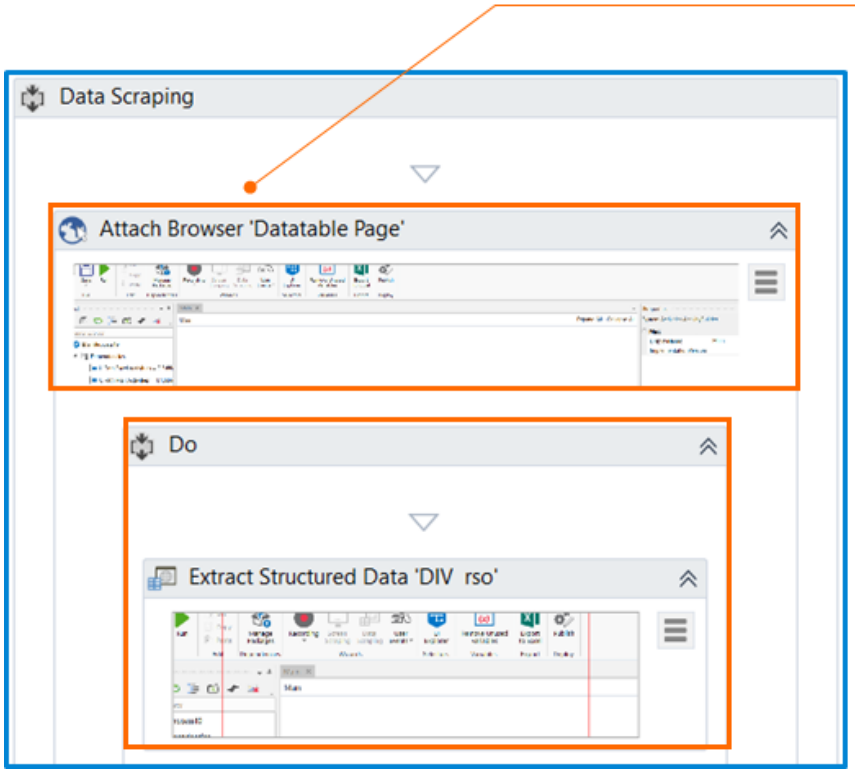
see **Demo4 – DataScraping**

UiPath

Extract Wizard. Step 7

Wizard opening | Field selection | Column naming | Pattern preview | Correlated data | Multiple page selection | **Extraction of results**

- the **Designer** will be populated with **a sequence of all the activities**, just like for **Screen Scraping;**
- a **DataTable** variable is initialized with the extracted information.



see **Demo4 – DataScraping**

Demo 4. Data Scraping

- **Automate the following process;**
  - ***open*** **the www.cs.ubbcluj.ro web page in Chrome browser;**
  - ***extract*** **and** ***save*** **the data available in Announcements section;**
    - ***the Announcements section consists of title, date and content;***
    - ***use*** **Data Scraping Wizard /Extract Wizard** ***to take out data from the web page;***
    - ***specify the maximum number of results;***
  - ***save*** **the extracted data into an Excel workbook;**
    - ***use Write Range activity from Workbook activity package.***

see **Demo4 – DataScraping**

Next lecture

- **Lecture 06**
  - Selectors

References

- UiPath Docs
  - https://docs.uipath.com/studio/docs
- UiPath Forum
  - https://forum.uipath.com/
- UiPath Academy
  - https://academy.uipath.com/