CoreGraph application development and specification documentation

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1 Introduction

CoreGraph is an user interface application, which can connect to a graphical tablet from the series "Intuos Pro" and extract data captured by the tablet in real time. It consists of three pages: the "Main" page (Fig 1), the "Scan and Connect" page (Fig3) and "Real-time ink" page (Fig4). The functionalities of each page is explained in section 3.

2 Requirements to run

First of all, the application requires a working **Intuos Pro tablet**. The application is tested only on *Intuos Pro L : Paper edition*, however CoreGraph must be working correctly with the rest of the tablets from the Intuos Pro series.

Before starting the application make sure that you follow the instruction for installing the tablet drivers from the following page: https://www.wacom.com/en-ch/getting-started/intuos. Check whether the helper applications "Wacom Tablet Properties" and "Wacom Desktop Center" are existing on your Windows machine to verify that everything has been installed correctly and that the tablet is visible to your operation system. The application works with the beta version of Common Device Library (CDL) v.2, which has been kindly provided by the Wacom Developer Support.

Another important task to do before working with the application is to calibrate the tablet to the canvas, so that the full tablet area is used and the pen does not move out of the canvas. The best way to do this is to ,first, start the application, connect it with the tablet (see section 3.5) and click on a "Start task". This action should open a page that looks like Figure 4. Then, go to the Wacom Tablet properties app and then click on "apping". Then, choose "Proportion" from the Screen Area section. Right after, a new window will appear,

which has the option “Click to define screen area”. That will allow you to select the corners of your canvas and restrict the pen from going out of the canvas. Then go back to mapping and make sure that Tablet Area is set to “Full” to use the full tablet. You can draw several lines on the tablet to confirm that the pen does not go out of the canvas.

3 Main components

This section showcases the main component of the application and explains the process of the usage.

3.1 Configuration file

To support a simple insertion/deletion of tasks a configuration file with name “CoreGraph.dll.config” is added to the directory. Within *instructions* one can see that multiple tasks are added, as the key property is the name of the task, while the value equals the instructions for that specific task. To add a task simply create a new line, copying the structure of the rest, and put the desired name and instructions as shown (see Fig 5). After making the changes, save the file and open the application to confirm that the tasks appear correctly.

Additionally, in case the license of the application is expired, it must be changed with a new one. For this purpose, follow the instructions in https://developer-docs.wacom.com/sdk-for-signature/docs/en/license. Then, simply replace the license in the .config file and the problem will be resolved. The current license is valid **until 01/09/2021**. In case of an invalid license on startup, an error message must appear (different from expired license) and connection with the tablet will be impossible.

3.2 DrawingTask class

The core unit of the application is the DrawingTask object, which defines a single task and can be managed dynamically through the configuration file. An instance of the DrawingTask stores the name, the instructions, the state of the buttons and the current data points which have been recorded by the tablet for each task. All drawing tasks are initialized in the Main page.

3.3 Main Window

The MainWindow class is a necessary part of the application as it contains an instance of the Main page and controls the closing event by throwing an error message when there is any unsaved data. The rest of the functionality is handled by the three pages.

3.4 Main Page

3.4.1 Coding details

The “MainPage.xaml” and “MainPage.xaml.cs” contain XAML and the C sharp code, respectively. The xaml code contains standard labels, text boxes and buttons. Additionally, it defines an ItemsControl, which uses a DataTemplate to visualize all tasks. It is important to note that all buttons within that panel are using different binding properties, which allow the DrawingTask class to control directly the visualization. Therefore, the logic that controls the UI is implemented in “MainPage.xaml.cs” (see the code for more details). In order to navigate through the three different pages, the application uses a NavigationService (see documentation **?**).

3.4.2 Functionalities

As shown on Figure 1 the Main page allows for:

- Insertion of a ID code - To insert an ID one just needs to type symbols in the box next to “ID code” and click “Save” to save the current ID. In case there is already some recorded data with the current ID, then an error message appears: “The user ID is already existing! Please insert a unique ID.” and the ID will not be allowed. In case the saving is successful, a message will appear on the screen and the “Start Task” buttons will become available. Warning: The recorded strokes data in application is removed when a new user ID is saved, thus, make sure that all data from previous users is exported before adding a new user.

- Verification of current tablet status - Shows the current status of the tablet, which has two options: "Not connected to a device" and "WacomDriver ready to use". In the first case, the user can only see the instructions of the each task, while the second case allows the user to start tasks and export files.
- Link to the "Scan and Connect" page - through the "Scan for Device" button.
- Task Management (instructions, initialization and exports) - Detailed explanation in section 4.

3.5 Scan and Connect Page

The page is kindly provided by the Wacom support. It allows the application to connect to different Wacom devices using USB, Bluetooth or Bluetooth Low Energy connection. The current version of the CDL, however, supports only a USB connection. On the right side of the window the available devices will be shown. The application can successfully connect to the 'Intuos Pro L' device, which represents the USB driver connection with the tablet. The option for Bluetooth driver is currently unavailable for use. It could be possibly implemented and supported by a future Wacom CDL version.

Theoretically, to integrate the Bluetooth connection option in the code, a Bluetooth watcher must be included similarly to the USB and Wacom driver watchers. The scanning task has to be implemented as well. Additionally, the logic for starting and interrupting the connection must be programmed (see the code to follow the USB example).

To connect to the USB driver, first select the 'Intuos Pro L' option and then click on the 'Connect' button. This action will bring the user back to the main page of the application. The Status graphical tablet must change to 'WacomDriver ready to use' including a green light indicating the successful execution of the task. In case this message does not appear on the screen, then a developer must be contacted.

In case the option 'Intuos Pro L' is not visible, this means that the tablet is not connected. Try to connect the tablet to the computer, the application must automatically detect the driver and display the option in few seconds.

3.6 Real-time Ink Page

This page appears after a "Start Task" button is clicked. The page contains a canvas, which will display all strokes with the Wacom pen on the tablet. It is important that the proportions of the tablet are set correctly (see section 2 - last paragraph). Moreover, the X and Y coordinates of the pen will be displayed in case the tablet detects movement. If the pen is touching the screen a label "DOWN" will be displayed, while if the pen is only hovering (close, but not touching), then the label will be "UP".

The page also contains a button "Save Data", which allows the user to save the current data. The button will become green if the data has been saved successfully. Then, the user can go back to the "Main Page", using the back button in the left top corner. In case the user makes more strokes on the tablet and then goes back to the main page, these last strokes will not be saved! Also, note that this button does not automatically export the data to a file. In order to save the data in a file, the user have to click on the export button.

Note that it is possible that one uses the mouse to draw on the canvas, however such data will only be displayed but not saved, therefore a pen is required for recording data.

4 Task Management

The tasks are the most complex part of the application, thus the document provides detailed explanation of usage. There are five buttons per task: 1. "See Instruction", 2. "Start Task", 3. Export data (.csv)", 4. Trash bin

- 1. The button opens a small dialog box which displays the instructions as set in the configuration file.
- 2. The button opens a new window which allows the user to draw on the tablet. It is not possible that two tasks start simultaneously. If a certain task has been completed and the button "Start Task" is clicked again, the data from the previous take will not be deleted. However, if new strokes are applied and the "Save Data" button is clicked, then the previous data from the same task will be overwritten within the application.

- 3. When the button is clicked for the first time, it creates a new folder with the ID of the current user within the directory of the app. Then the current saved data is send to a .csv file whose name contains the task name and user ID (e.g Hold Pen-A_Maxime123.csv). The button is enabled when there is data to be exported, if the current data has already been exported then the click will not change anything. However, if some data has been exported, but new data has been currently recorded, the button will overwrite the previous data and the file will contain the new points (see Tests).
- 4. The trash button deletes the currently saved data for a task, however it will not delete any exported data.

Additionally, there is the "Export all" button, which sends all recorded data to a folder and creates a .zip file.

Note: If the tablet gets disconnected while the user is in the Main page or Real-time ink page, the application will display an error message and send the user directly to the "Scan and Connect" page, but no data will be lost. The user can simply connect the tablet again, or navigate to the main page and export the unsaved information. Of course, it will not be possible to start a new task, if the tablet in not connected as an error message will be displayed.

5 Tests

Test(before connected device): Scan for device → Intuos Pro L → **Connect** → WacomDriver ready to use (Works correctly).

Test(before connected device): Type an **existing user** ID → Save ID → Error message appears (Works correctly).

Test(after connected device): Start task → Draw → Save Data → Go back → Click **Trash button** → data is deleted and exports become unavailable (Works correctly).

Test (after connected device) : Start task → Draw → Save Data → Go back → **Trash All** → New task can be started (Works correctly).

Test (after connected device): Start task → Draw → Save Data → Go back → Repeat this for all other tasks → Export the files in **random order** → Works correctly.

Test (after connected device) : Start task → Draw → Save Data → Go back → Export to csv → **Start same task** → Draw → Save Data → Go back → **Export to csv** → Result: Only the second draw actions are saved in the .csv file (Works correctly).

Test (after connected device) : Start task → Draw → Save Data → Go back → Export to csv →

Test (after connected device) : Start task → Draw → Save Data → Go back → Export to csv → **Export all (.txt)** → Error: No data has been recorded (because there are no exported txt file) - Works correctly.

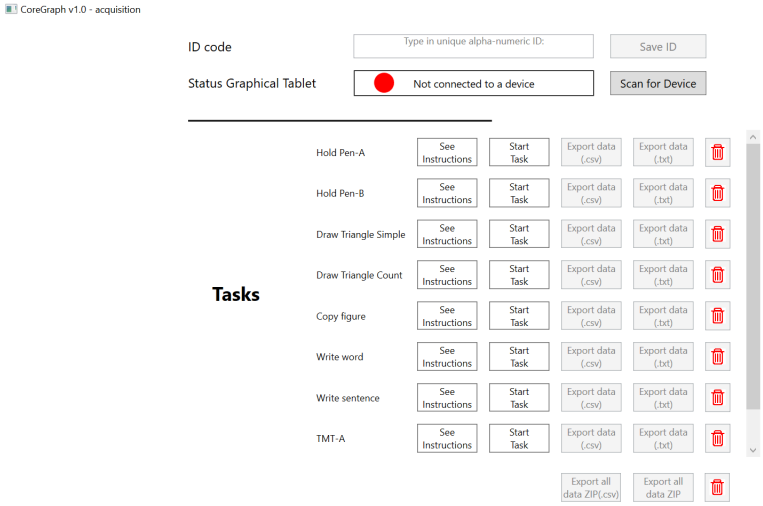

Figure 1: Main page - Initial screen

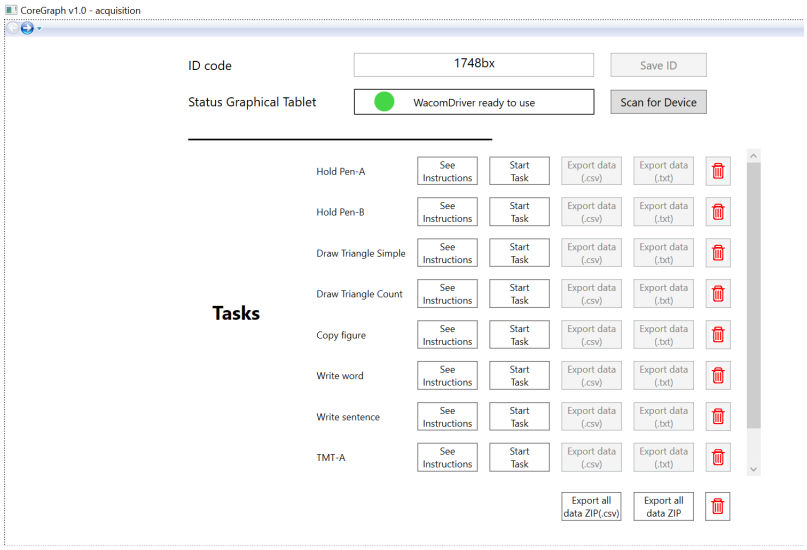

Figure 2: Main page after tablet is connected

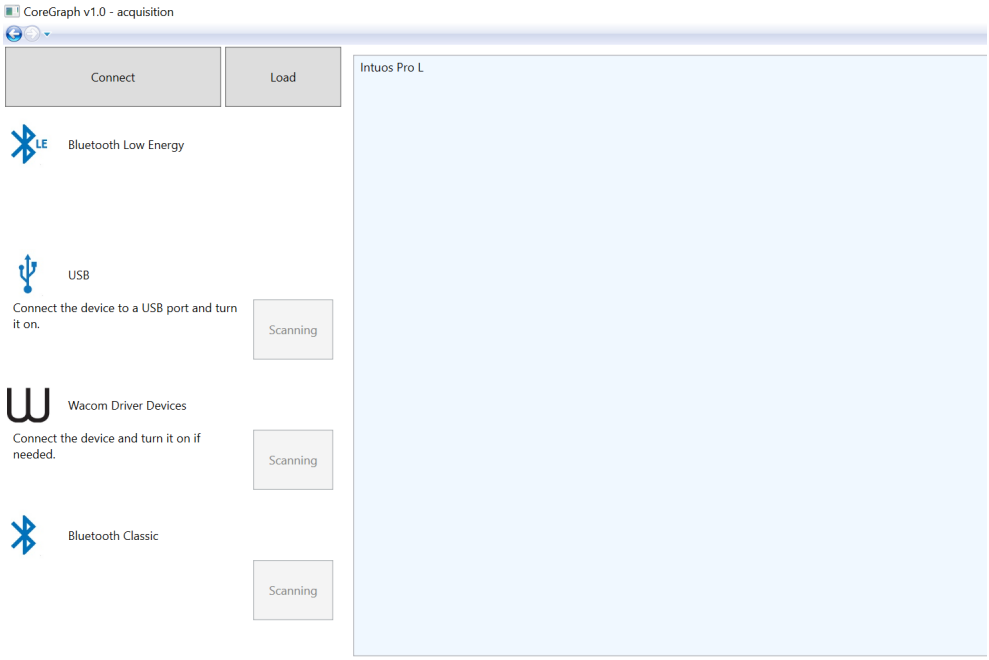

Figure 3: Scan and Connect page

Figure 4: Real-time ink page

CoreGraph.dll.config - Notepad

File Edit Format View Help

```
<?xml version="1.0" encoding="utf-8" ?>
<configuration>
        <configSections>
                <section name="license" type="System.Configuration.AppSettingsSection"/>
                <section name="instructions" type="System.Configuration.AppSettingsSection"/>
        </configSections>

        <license>
                <!-- Add your license key here! -->
                <add key="Wacom.License" value="eyJhbGciOiJSUzUxMiIsInR5cCI6IkpXVCJ9.eyJpc3MiOiI3YmM5Y2IxYWIxMGE0NmUxODI2N2E5MTJkYTA2ZTI3NiIsImV4cCI6MTYzMDQ1

        </license>

        <instructions>
                <add key="Hold Pen-A" value= "The task sheet for Hold pen-A shows a target in the middle of the sheet. The participant must keep the tip of t
                <add key="Hold Pen-B" value= "The task sheet for Hold pen-B shows a target in the middle of the sheet. The participant must keep the tip of t
                <add key="Draw Triangle Simple" value= "The task sheet for Draw Triangle Simple is empty. On the sheet, the participant must draw superposed
                <add key="Draw Triangle Count" value= "The task sheet for Draw Triangle Count is empty. The participant must perform the Draw Triangle Simple
                <add key="Copy figure" value= "The task sheet for Copy figure contains the example drawing on the left. The participant must copy this drawin
                <add key="Write word" value= "The task sheet for Write word contains a horizontal line. The participant is asked to think of a word and write
                <add key="Write sentence" value= "The task sheet for Write sentence contains horizontal lines. The participant is asked to think of a sentenc
                <add key="TMT-A" value= "The task sheet for TMT-A contains 10 circles, numbered from 1 to 10. Circle 1 is marked as “Départ”. Circle 10 is ma
                <add key="TMT-B" value= "The task sheet for TMT-B contains 10 circles, numbered from 1 to 5, and from A to E. Circle 1 is marked as “Départ”.
        </instructions>

</configuration>
```

Figure 5: Configuration file