AUTOMATION OF THE BOOK COVER CREATION PROCESS

Y. Hrabovskyi, M. Chernova

*Simon Kuznets Kharkiv National University of Economics,
9-a Nauky ave., Kharkiv, 61166, Ukraine*

The article presents the research to improve the process of designing book covers in the direction of automation. The stages of the book cover design process are explained. The tools that allow automating the construction of the cover layout are studied. To do this, using scripts in Adobe Illustrator is suggested. The process of adding a script and its work is described. The tools for automation of the stage of creating the original layout of the book cover are studied. A database has been developed to speed up the process of selecting illustrations. To implement this task, the development environment of SQL Server management studio / Visual studio, T-SQL language was chosen. C # was used to describe the image gallery. Based on the analysed theoretical material and developed software elements, the method of designing book covers was formulated. The practical result is the elements of software for automation of individual parts of the process of designing book covers publications.

Keywords: *cover, automation, format, script, database, layout, illustration.*

Formulation of the problem. Today, one of the most pressing issues in the field of printing is the issue of automation of as many stages of production of printed products. Various systems are emerging to minimize human interference in the production process, special equipment is controlled by computer technology, special techniques and guidelines are developed for the correct operation of automated systems. However, despite the large amount of research in this area, there are still few automated or even manual operations in various areas of printing production. For example, at the stage of prepress, the process of designing book covers should be studied in more detail in terms of the possibility of its automation.

Analysis of recent research and publications. Scientific research on the subject of the article is devoted to print optimization [1–3], image processing and color scheme optimization [2–6], quality control of prepress [6–9], the use of adaptive algorithms for image preparation for printing [9–11].

However, today in the specialized literature there is no comprehensive method of automating the process of creating a book cover.

The purpose of the article. The main purpose of the study is focused on the development of methods for automating the process of creating a book cover.

Presentation of the main research material. The process of designing a book cover contains the following stages:

1) Calculation of cover parameters (dimensions of sides, margins, allowances for trimming, root width).

2) Construction of the cover layout.

3) The choice of composition (illustration) on the cover and the mutual placement of all design elements together with the text (which has already been edited).

4) Creating a printable file (for example, .pdf).

The process of designing a cover layout includes the following steps:

1) choice of publication format;

2) determination of the properties of printing materials (thickness and looseness of the paper for the book block);

3) calculation of the thickness of the book block and, as a consequence, the root;

4) determining the type of cover;

5) construction of the model (taking into account further pruning).

According to DSTU 3018, the format of the publication is the size of the finished publication, which is determined by the width and length of the publication page in millimetres or the width and length of the sheet of paper in centimetres, indicating the part occupied by the publication page.

The cover format includes the format of the front and back sides and the root. Because the soft cover after cropping has the same format as the edition itself, the final size of the image area — the picture box — on the front side of the cover will be the size of the cropped page.

Next, based on the number of pages in the publication and the type of paper on which the publication will be printed, determine the thickness of the book block (and, accordingly, the root of the cover) and choose the type of cover.

To calculate the width of the root, I usually use a simple formula:

Root width = Paper thickness (mm) * Number of sheets in the block (pcs).

According to GSTU 29.4 - 2001 we choose the type of cover.

Next, we design a layout. First, the layout of the cover is constructed in the format before trimming, and then, taking into account the necessary fields for trimming, the format is delimited after trimming.

As a result, we obtain a layout of one of the species (Fig. 1 a, b):
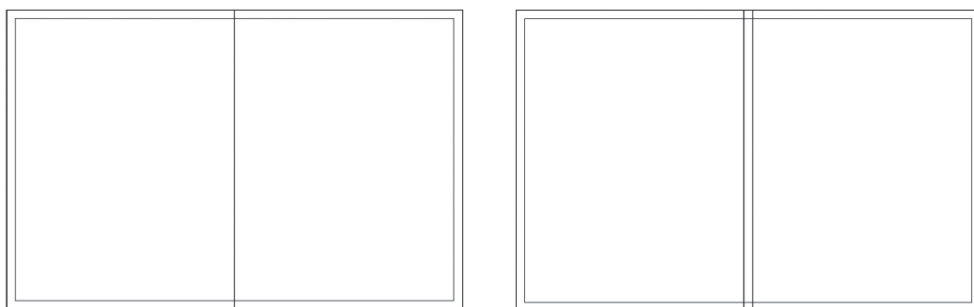
a)   b)

Fig. 1. Cover layouts: a - type 1; b - types 2, 3

To automate the process of creating a book cover, you should write a script.

Consider the concept of scripting within Adobe Illustrator.

A script is a set of commands that pass information to Illustrator about certain actions. Such actions can be simple, ie acting on only one object, or complex, ie interacting with several (or all) document objects (or all Illustrator documents). Moreover, these actions can be used only by Illustrator, and auxiliary software, such as text editors and database management programs. Most tasks performed by the user through menus, palettes, dialog boxes can be performed using scripts.

Using scripts allows you to manage Illustrator files automatically. Scripts are usually written to create documents and objects, to perform most of the operations that are achievable interactively in Illustrator, using palettes and windows. Scripts are extremely useful as one way to automate daily tasks that are complex and repetitive. This approach saves time and effort on memorizing steps and sequences of operations. For example, you can write a script that systematically creates new objects, changes the position of these objects, and their colour. You can also write a script that resizes objects, reshapes them, and more. Without the use of scripts, this process is quite time consuming.

The use of scripts is not the prerogative of programmers only - today such a need arises in most designers.

Adobe Illustrator supports JavaScript, which is an easy-to-use and platform-independent programming language.
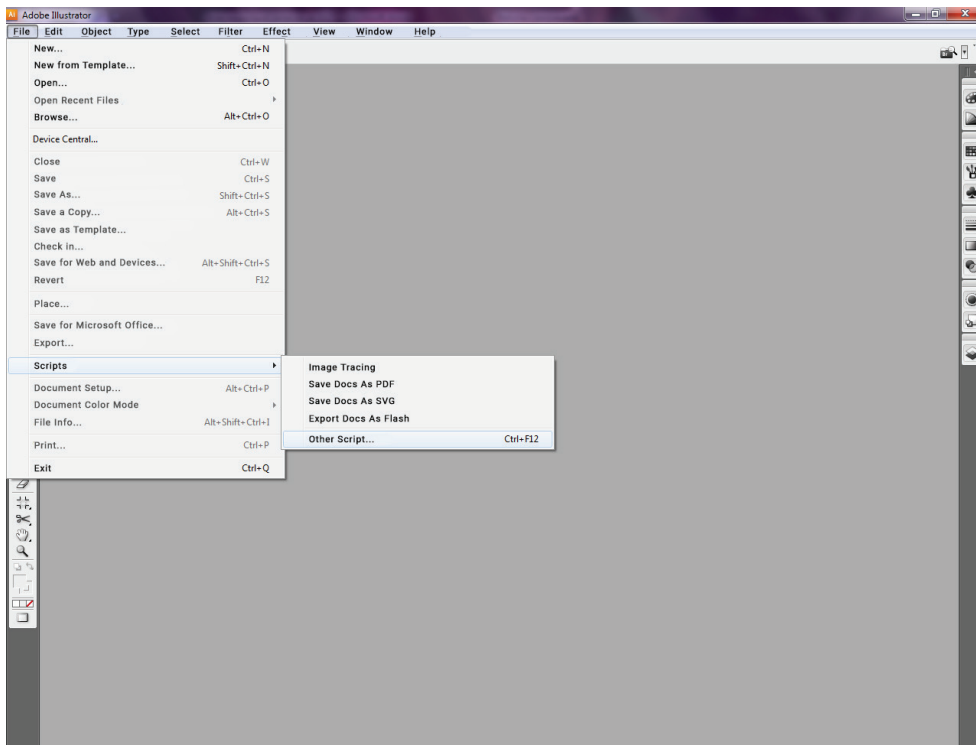

Fig. 2. Run the macro

Using JavaScript:

To run any script from Illustrator you need:

1) In the menu File> Scripts> Browse (File> Scripts> Browse)

2) Select a file with a written script.

3) Double-click on it, or click on the "Open" button.

To make the script accessible from the menu item, place the script file in the following directory: Adobe Illustrator \ Presets \ Scripts, and then restart the program. After that, every time you start Adobe Illustrator, any script located in the above directory is automatically added as a menu item. Thus, the newly written script will be among the automation scripts listed in the menu, available at this address.

To begin the process of constructing a cover layout, you need to run Adobe Illustrator. Then, without creating a new document, using the menu File / Scripts / Other script (File / Scripts / Other scripts) or the key combination Ctrl + F12 run from the folder pre-prepared macro - file "cover layout.js" (Fig. 2).

After selecting the macro, a window appears asking: Please enter the width (Fig. 3). The default value is 130 (meaning 130 mm). You must enter the width of the cover before trimming.
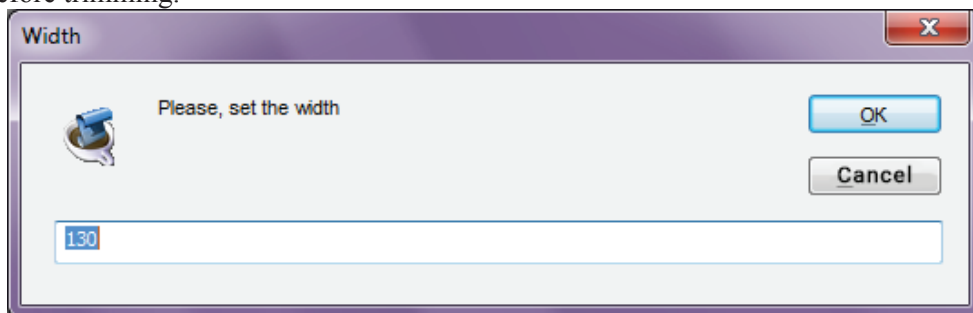

Fig. 3. Set the width of the cover before trimming

Then there is a similar window requesting the height of the cover before trimming (Fig. 4). The default value is 170 mm. The user enters the required value.
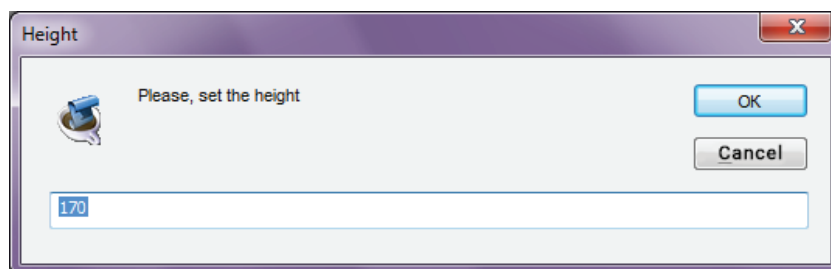

Fig. 4. Set the height of the cover before trimming

The last window asks the user to enter the width of the root (Fig. 5). The default value is 5 mm. Set the required parameter and press OK or Enter.
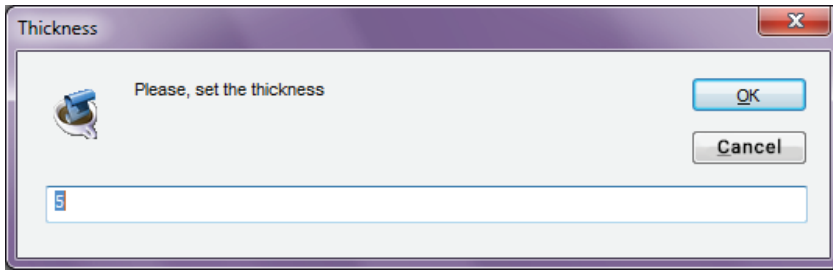
Fig. 5. Set the width of the root of the cover

It is necessary to specify what format of a cover was before trimming. Otherwise, the layout will be built incorrectly. After that, the program constructs the layout itself, for example (if you leave the default parameters) as follows (Fig. 6).
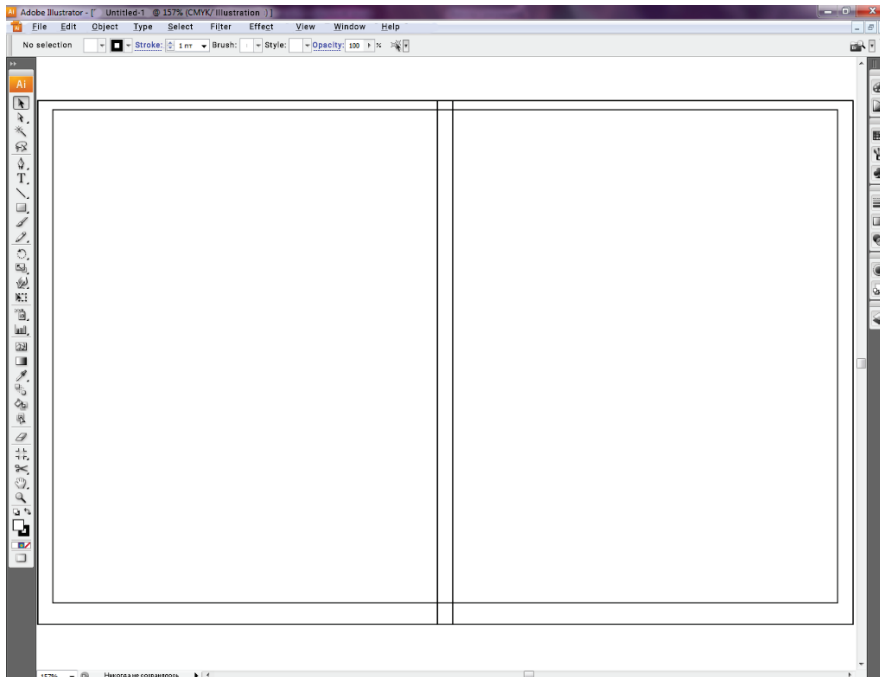

Fig. 6. Automated cover layout construction

The outer rectangle is the format of the cover before trimming, the inner rectangle is the border of the cover after trimming. The root of the cover is delimited in the middle.

You can select one of the rectangles and make sure that it is transparent and has only a black outline (this is important in the further construction of the original layout of the cover). And also check the correctness of the layout of the palette "Information" (Fig. 7). As you can see, all the parameters are correct (the rectangle has a black stroke line and no fill colour; the format of the cover to the edge is 130x170, as specified).
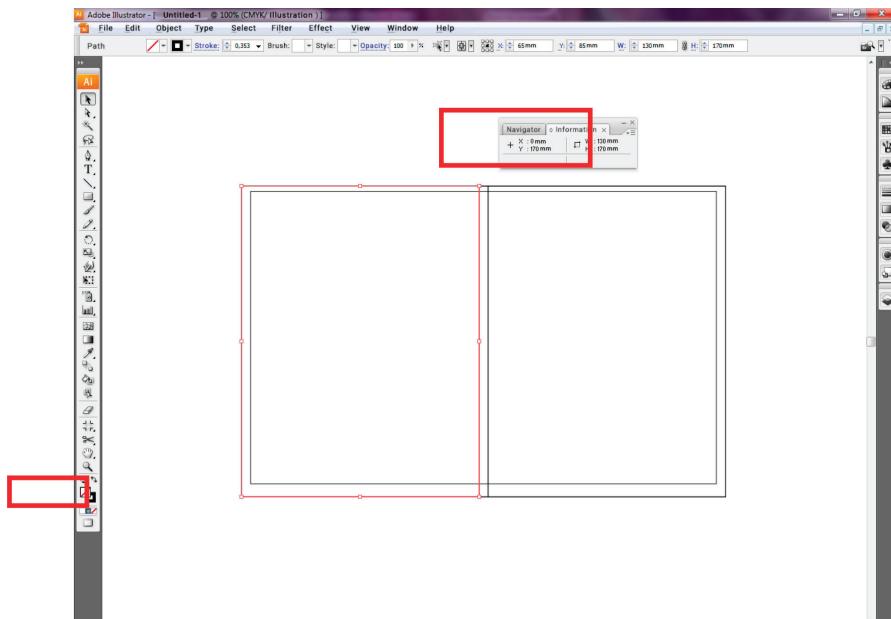
Fig. 7. Check the layout elements of the cover

During the development of the script for the automated layout of the book edition, a significant problem was identified that could prevent the correct construction of the layout if it is not eliminated. This problem is that the value that the user enters in the size query windows is perceived by the program as the value specified in the items. Therefore, it is necessary to enter the special factor thanks to which points will be listed on millimetres:

$$koef = 2.834645;$$

The value of the coefficient was invented experimentally. Thus, the values obtained from the user must be multiplied by this factor.

It should be noted that when creating a new document (which is also executed by a script), a colour model is set immediately, namely CMYK, which allows the designer to avoid a common mistake with incorrect subsequent display of colours. The colour model is specified by the DocumentColourSpace.CMYK parameter.

It should also be noted that the script takes into account the allowances for trimming, which can be changed if necessary.

The versatility of the developed script is that it can construct a layout of each of the types of covers set by regulations and has the potential to expand.

To speed up the process of selecting illustrations and partial automation of the stage of creating the original layout of the book cover, it is advisable to develop a database.

To implement this task, the development environment of SQL Server management studio / Visual studio, T-SQL language was chosen. The description of the image gallery is made in C #.

For the created database it is necessary to make 3 tables: Categories, SubCategories and Images. Therefore, each illustration will belong to a separate section, which in turn belongs to a specific section.

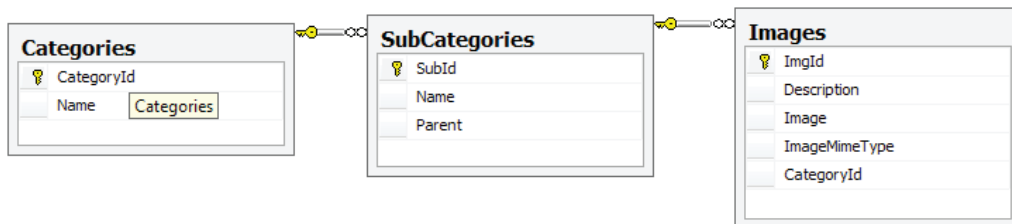The fields specified for the tables are shown in Fig. 8.

Fig. 8. Database tables, fields and relationships between them

Externally, the database shell is a site, access mode - www.tibidoh.is-a-geek.net.

It is necessary that the database has a clear structure and a convenient classification for the publisher. The developed prototype of the database was based on the classification adopted in many large publishers, ie the division of literature into art, applied and children's.

Within each category, its own subcategories were identified, the visual representation is shown in Fig. 9.
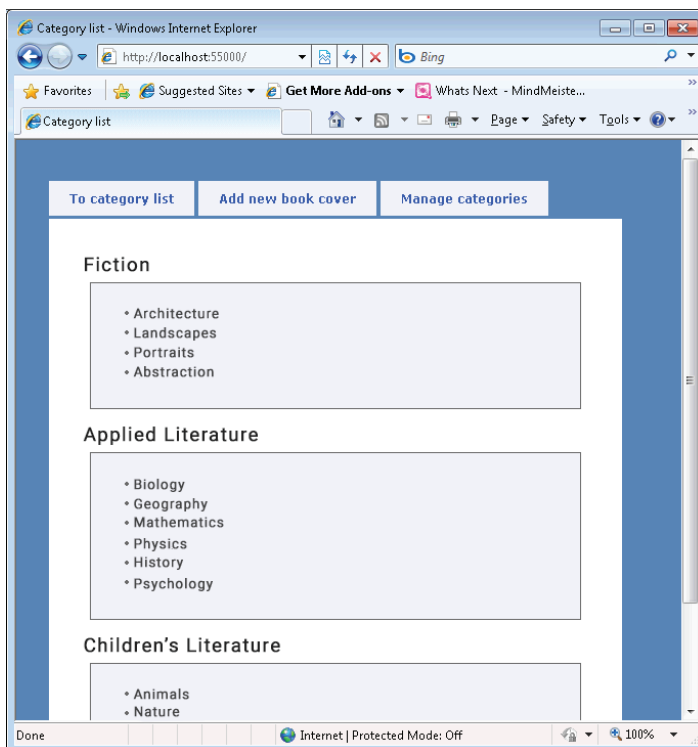

Fig. 9. Database structure

It is convenient to manage categories and subcategories using the "Manage categories" tab (Fig. 10), which allows you to add and remove a category or subcategory.

Fig. 10. Category management

Replenishment of the database with new images is simple: tab "Add new book cover" (Fig. 11) button "Browse" to select the files to be added, select a category ("Book category") and a description of the illustration, if necessary ("Cover description"). Note: You cannot add an image directly to a category without selecting a subcategory. It is believed that each illustration will belong to a specific subcategory.
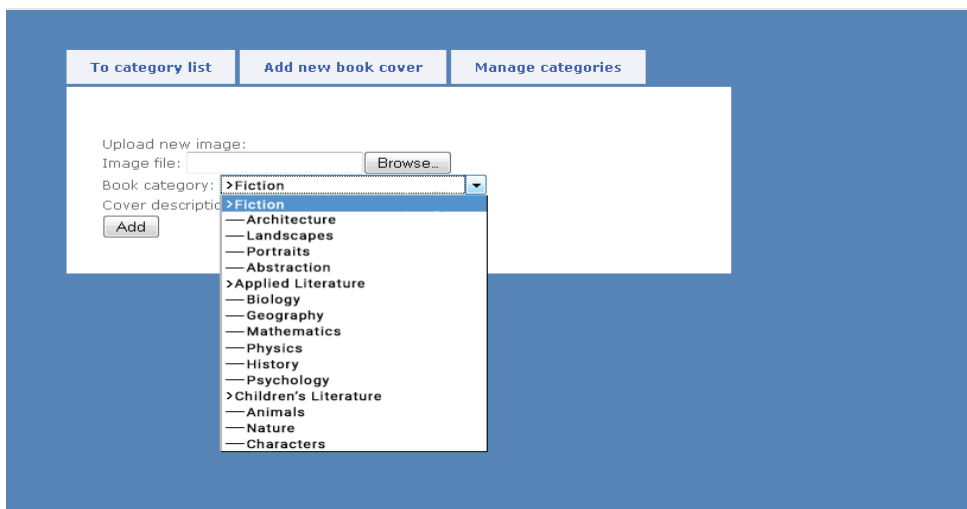

Fig. 11. Adding new images to the database

Therefore, after filling the database, this view is presented in Fig. 12. For example, the category "Architecture" is shown.

Fig. 12. Category "Architecture"

Thus, we see that database management from the user's point of view is extremely simple.

The use of such a system in the publishing house will significantly simplify the process of exchanging illustrations between employees and storing illustrations, reduce the time to complete the process of creating an original layout.

Let's combine the developed software elements into a single method of creating book covers.

Based on the analysed theoretical material and developed software elements, the method of designing book covers was formulated.

Step 1. Calculation of parameters and construction of the cover layout.

A script is used to implement this step. Software for implementation - Adobe Illustrator CS3.

Step 2. Creating a composition and constructing an original layout.

1) the formation of the idea and the choice of the type of cover design. Performed by an art editor.

2) selection of illustrations. We use the developed database, which has a shell in the form of a site (site address - www.tibidoh.is-a-geek.net).

3) creating a composition. Using selected illustrations and selecting the necessary fonts, the designer or art editor forms the composition according to all the requirements for the original layouts. Software for implementation - Adobe Illustrator CS3.

4) creating a barcode. For automated construction we use the CorelDRAW X3 software product and import it into a ready-made original layout developed in the program - Adobe Illustrator CS3.

5) arrangement of labels and scales (if necessary, in agreement with the printing house). Implementation - the use of ready-made scripts for automated construction or the use of labels and scales provided by the printing house.

Step 3. Prepare the cover for printing.

1) convert the finished original layout to a PDF file using Adobe Acrobat and the Acrobat Distiller plugin.

2) check the file for errors using Adobe Acrobat and the Enfocus PitStop plugin. The cover is ready.

The developed technique is implemented using the program AutoRun Pro Enterprise.

Thus, a methodology was created and software elements in the form of a script and a database were developed, which will allow:

1) easily and quickly create a book cover, even if the user of the technique is a novice designer;

2) automate routine processes, allowing the art editor and designer to engage in creative rather than mechanical work;

3) speed up the process of creating the cover of a book publication, which in turn, after automating the layout process and other prepress processes will reduce the time to prepare the publication for printing;

4) avoid common mistakes associated with incorrect calculation of cover parameters, which in turn will allow the publisher to prevent material losses, etc.

Conclusions. As part of the research, a system was developed to automate the process of designing book cover layouts, as well as a database to simplify and make more convenient the process of finding and selecting illustrations for book covers. The developed system of automated construction of book cover layouts is a script written in JavaScript, which works in the software product Adobe Illustrator. This development is of practical importance for both beginners and professional designers. It significantly reduces the time to create a layout of the book cover, reduces the risk of errors in the construction of the layout. The system is one way to automate daily tasks that are complex and repetitive. The script will allow even a novice designer to create a cover layout in a few steps. In addition, a method of designing book covers was formulated, which includes the developed elements of automation.

СПИСОК ВИКОРИСТАНИХ ДЖЕРЕЛ

1. Dietzel D., Ioannou M. A review of the polygraph: history, methodology and current status. *Journal Crime Psychology Revie*w. 2015. Vol. 1. Issue 1. Pp. 59–83. DOI: https://doi.org/10.1080/23744006.2015.1060080.

2. Urbas R., Stankovič U. Color differences and perceptive properties of prints made with microcapsules. *Journal of graphic engineering and desig*n. 2015. Vol. 1. Pp. 15–21.

3. Nomura K., Ushijima H., Mitsui R., Takahashi S., Nakajima S. Screen-offset printing for fine conductive patterns. *Microelectronic Engineering*. 2014. № 123. Pp. 58–61.

4. Chitradevi B., Srimathi P. An Overview on Image Processing Techniques. *International Journal of Innovative Research in Computer and Communication Engineering.* 2014. Vol. 2. Issue 11. Pp. 6466–6471.

5. Aralova N. The method of technology evaluation based on improved cost approach. *Science and Innovation.* 2017. № 13 (3). Pp. 65–76. DOI: https://doi.org/10.15407/scine13.03.065.

6. Kapela R., Guinness K., O'Connor N. Real-time field sports scene classification using colour and frequency space decompositions. *Journal of Real-Time Image Processing*. 2017. Vol. 13. Issue 4. Pp. 725–737. DOI: https://doi.org/10.1007/s11554-014-0437-7.

7. Pushkar O., Hrabovskyi Y., Gordyeyev A. Development of a method for optimizing the site loading speed. *Eastern-European Journal of Enterprise Technologies*. 2020. 6(2 (108). 21–29. https://doi.org/10.15587/1729-4061.2020.216993.

8. Khamula O. H., Soroka N. V., Vasiuta S. P. Optimization of mathematical model of the impact factors hierarchy of the interface use based on mobile. *Поліграфія і видавнича справа*. 2016. № 2 (72). С. 28–35.

9. Safonov I., Kurilin I., Rychagov M., Tolstaya E. Adaptive Image Processing Algorithms for Printing. Heidelberg, 2018. 304 p.

10. Алексєєнко Н. Ю. Оцінка якості додрукарської підготовки виготовлення книги. *Scientific Journal «ScienceRise»*. 2017. № 9 (38). С. 29–32. DOI: https://doi.org/10.15587/2313-8416.2017.110976.

11. Khamula O. H., Soroka N. V., Vasiuta S. P. Factors of influence of interface use based on mobile applications. *Наукові записки [Української академії друкарства]*. 2016. № 2. С. 28–36.

REFERENCES

1. Dietzel, D., & Ioannou, M. (2015). A review of the polygraph: history, methodology and current status. *Journal Crime Psychology Revie*w, 1. Issue 1, 59–83. DOI: https://doi.org/10.1080/23744006.2015.1060080 (in English).

2. Urbas, R., & Stankovič, U. (2015). Color differences and perceptive properties of prints made with microcapsules. *Journal of graphic engineering and design*, 1, 15–21 (in English).

3. Nomura, K., Ushijima, H., Mitsui, R., Takahashi, S., & Nakajima, S. (2014). Screen-offset printing for fine conductive patterns. *Microelectronic Engineering*, 123, 58–61 (in English).

4. Chitradevi, B., & Srimathi, P. (2014). An Overview on Image Processing Techniques. *International Journal of Innovative Research in Computer and Communication Engineering*, 2, Issue 11, 6466–6471 (in English).

5. Aralova, N. (2017). The method of technology evaluation based on improved cost approach. *Science and Innovation*, 13 (3), 65–76. DOI: https://doi.org/10.15407/scine13.03.065 (in English).

6. Kapela, R., Guinness, K., & O'Connor, N. (2017). Real-time field sports scene classification using colour and frequency space decompositions. *Journal of Real-Time Image Processing*, 13, Issue 4, 725–737. DOI: https://doi.org/10.1007/s11554-014-0437-7 (in English).

7. Pushkar, O., Hrabovskyi, Y., & Gordyeyev, A. (2020). Development of a method for optimizing the site loading speed. *Eastern-European Journal of Enterprise Technologies*, 6 (2 (108), 21–29. DOI: https://doi.org/10.15587/1729-4061.2020.216993 (in English).

8. Khamula, O. H., Soroka, N. V., & Vasiuta, S. P. (2016). Optimization of mathematical model of the impact factors hierarchy of the interface use based on mobile. *Polihrafiia i vydavnycha sprava*, 2 (72), 28–35 (in English).

9. Safonov, I., Kurilin, I., Rychagov, M., & Tolstaya, E. (2018). Adaptive Image Processing Algorithms for Printing. Heidelberg (in English).

10. Aleksieienko, N. Yu. (2017). Otsinka yakosti dodrukarskoi pidhotovky vyhotovlennia knyhy. *Scientific Journal «ScienceRise»*, 9 (38), 29–32. DOI: https://doi.org/10.15587/2313-8416.2017.110976 (in Ukrainian).

11. Khamula, O. H., Soroka, N. V., & Vasiuta, S. P. (2016). Factors of influence of interface use based on mobile applications. *Naukovi zapysky [Ukrainskoi akademii drukarstva]*, 2, 28–36 (in English).

АВТОМАТИЗАЦІЯ ПРОЦЕСУ СТВОРЕННЯ КНИЖКОВОЇ ОБКЛАДИНКИ

Є. М. Грабовський, М. О. Чернова

Харківський національний економічний університет імені Симона Кузнеця,
пр. Науки, 9-а, Харків, 61166, Україна
maxmin903@gmail.com, genchevanata@gmail.com

У статті проведено дослідження щодо вдосконалення процесу проектування обкладинок книг у напрямку автоматизації. Роз'яснено етапи процесу проектування обкладинки книги. Розглянуто основні етапи побудови макету обкладинки. Досліджено інструменти, які дають змогу автоматизувати побудову макету обкладинки. Для цього пропонується використання скриптів у програмі Adobe Illustrator. Розглянуто поняття скриптингу у межах програми Adobe Illustrator. Викладено процес додавання скрипту та його роботи. Досліджено інструменти для автоматизації етапу створення оригінал-макету книжкової обкладинки. Детально проаналізовані особливості автоматизації всіх етапів побудови макету обкладинки за допомогою створеного скрипта. У дослідженні під час розробки скрипту для автоматизованої побудови макету книжкового видання було виявлено суттєву проблему, що може завадити правильній побудові макету, якщо її не усунути. Ця проблема складається в тому, що величина, яку вводить користувач у вікна із запитами розмірів, сприймається програмою як величина, задана в

пунктах. Тому в статті було введено спеціальний коефіцієнт, завдяки якому пункти були перераховані на міліметри. Універсальність розробленого скрипту полягає в тому, що він може побудувати макет кожного з видів обкладинок, встановлених нормативними документами і має потенційну можливість для свого розширення. Для прискорення процесу вибору ілюстрацій було розроблено базу даних. Для реалізації поставленої задачі було вибрано середовище розробки SQL Server managenet studio/Visual studio, мова T-SQL. Для опису галереї малюнків було використано мову C#. На основі проаналізованого теоретичного матеріалу та розроблених елементів програмного забезпечення було сформульовано методику проектування книжкових обкладинок. Практичним результатом є елементи програмного забезпечення для автоматизації окремих частин процесу оформлення книжкових обкладинок видань.