PROCEEDINGS

of the Union of Scientists - Ruse

Book 5
Mathematics, Informatics and Physics

Volume 10, 2013

RUSE

The Ruse Branch of the Union of Scientists in Bulgaria was founded in 1956. Its first Chairman was Prof. Stoyan Petrov. He was followed by Prof. Trifon Georgiev, Prof. Kolyo Vasilev, Prof. Georgi Popov, Prof. Mityo Kanev, Assoc. Prof. Boris Borisov, Prof. Emil Marinov, Prof. Hristo Beloev. The individual members number nearly 300 recognized scientists from Ruse, organized in 13 scientific sections. There are several collective members too – organizations and companies from Ruse, known for their success in the field of science and higher education, or their applied research activities. The activities of the Union of Scientists – Ruse are numerous: scientific, educational and other humanitarian events directly related to hot issues in the development of Ruse region, including its infrastructure, environment, history and future development; commitment to the development of the scientific organizations in Ruse, the professional development and growth of the scientists and the protection of their individual rights.

The Union of Scientists – Ruse (US – Ruse) organizes publishing of scientific and popular informative literature, and since 1998 – the "Proceedings of the Union of Scientists- Ruse".

BOOK 5

"MATHEMATICS, INFORMATICS AND PHYSICS"

VOLUME 10

CONTENTS

BOOK 5

"MATHEMATICS, INFORMATICS AND PHYSICS"

VOLUME 10

This is the jubilee 10-th volume of book 5 Mathematics, Informatics and Physics. The beginning was in Spring, 2001, when the colleagues of the former section Mathematics and Physics decided to start publishing our own book of the Proceedings of the Union of Scientists – Ruse. The first volume included 24 papers. Through the years there have been authors not only from the Angel Kanchev University of Ruse but as well as from universities of Gabrovo, Varna, Veliko Tarnovo and abroad – Russia, Greece and USA.

Since the 6-th volume the preparation and publishing of the papers began to be done in English.

The new 10-th volume of book 5 Mathematics, Informatics and Physics includes papers in Mathematics, Informatics and Information Technologies, Physics and materials from the Scientific Conference 'Information Technologies in Education' (ITE), held at the University of Ruse in November 2012 in the frame of Project 2012-FNSE-02.

web: suruse.uni-ruse.bg

USE OF DYNAMIC SOFTWARE FOR SKETCHES IN GEOMETRY LESSONS

Mihail Kirilov

Angel Kanchev University of Ruse

Abstract: *The article presents some dynamical geometrical software. A teacher really has to include very often personal computers (PC) in his work. The mentioned software allows creation and manipulation with geometric constructions and export in HTML format.*
Keywords: sketch, dynamical geometric software, geometric construction.

INTRODUCTION

The application of information and communication technologies is the challenge ahead of education in modern days. The rapid progress of the technologies ranges over areas, associated with the development and the use of new methods and instruments of teaching and lays open new prospects for improvement in the educational process [3]. In an attempt to correspond to the current requirements the teacher certainly has to include very often in his work PC with their large variety of applications in the area of education [1].

EXPOSITION

The use of new technologies in the education is caused by the desire for automation or simulation of different actions, that are performed in classes. When teaching geometry the use of dynamical geometrical software is possible. It allows creation and manipulation with geometric constructions. Similar to the geometric sketches in the notebooks, every sketch starts with making some points. They are being used when defining new objects (line, circumference etc.). The sketches created are dynamical, which means that it is possible to move points (vertex of a triangle, heel of an altitude, center of a circumference) without breaking the geometric connections, that are building the basis of the sketch.

Such software is applied in many geometric situations such as retaining the distance, parallel transition, geometric proportion, etc. The idea is to observe what happens when some elements of one construction are being moved and how other elements are changing their position. The use of a dynamic software not only makes it easier to produce the sketch, when it will take much more time to make a correct one on a paper, but it adds as well to the knowledge of the basic constructions with some built in ones. For example, if it is needed to construct parallel lines by ruler and compass, then it is necessary to sketch a few lines and angles, while the dynamic geometric software allows this to happen just by the selection of the objects, that the sketch is dependent to – line and point for this example. In other words the use of dynamic constructions helps to learn geometry. Wide range of dynamical geometric software is available, but most of it practically has at its disposal instruments for sketching of the basic 2D objects: point, line, segment, circumference, arc, curved line, sector, regular polygon.

Let's consider the special feature of some of the most widespread dynamical geometric software 4]. Each programme includes built in constructions that are the basic characteristics that distinguishes it from the other programs. Universal characteristics for almost all of the programs are the possibilities of constructing perpendicular and parallel lines, angle bisectors, midpoint of a segment, circumference with a given centre, etc.

Important characteristic of some of the programs considered is the possibility of creating macros.

C.a.R. (Compas and Ruler)
Size: 4,41 Mb
Platform: PC/Mac
OS: Windows/Linux/Mac OS
Licence: free
Official site: http://mathsrv.ku-eichstaett.de/MGF/homes/grothmann/java/zirkel/.

The program simulates constructions by line ruler and compass. The creation of the basic geometric figures and constructions is possible. The possibility of measuring distance, area and angles is included. It is allowed to hide/view objects depending of their color. It gives the opportunity of creating macros and generating HTML file in which it is possible to make changes over the sketch. C.a.R. is valuable because of great number of examples included. It is suitable not only when teaching geometry, but for demonstrations and verification of the skills.

Cabri Geometry
Size: 3,5 Mb
Platform: PC/Mac
OS: Windows/Mac OS
Licence: paid; free demo version available
Official site: http://www.cabri.com/.

This is one of the most spread programs that are being used by the mathematicians in the university as a valuable instrument to achieve their science aims. It is developed by the company Cabrilog. It can be used to create sketches and to ask questions – for example if two lines are parallel (perpendicular). It is allowed to compare measures and also the program displays the equations of basic mathematical objects: lines, circumferences, ellipsis. The opportunity of publishing the sketches in web sites is offered.

Cinderella
Size: 15,1 Mb
Platform: PC/Mac
OS: Windows/Linux/Mac OS
Additional requirements: JRE
Licence: paid; free demo version available
Official site: http://cinderella.de.

The program offers wide range of geometric objects. The user friendly interface allows the creation of curves, circumference with given radii, circumference by 3 points. Reflection is a specific build in construction. The main difference from the other programs is that Cinderella offers representation in Euclidean, spheric or hyperbolic geometry at the same time. Animation of geometric places is included. Export in HTML is optional.

EUKLID DynaGeo
Size: 2,4 Mb
Platform: PC
Os: Windows
Licence: paid, free demo version available, but the use of the demo in schools is forbidden
Official site: http://www.dynageo.de/.

All the standard geometric objects can be created by the use of this program. The general geometric transformations are build in – translation, rotation, reflection. Angles and distances can be measured with EUKLID DynaGeo, the geometric objects are available for

filling with some colours. The creation of macros is available for the advanced users. Export in HTML is optional.

GeoGebra

Size: 2,5 Mb

Platform: PC/Mac

OS: Windows/Mac OS/Linux

Additional requirements: JRE

Licence: free

Official site: http://www.geogebra.at/.

This is a dynamical geometric software that combines geometry, algebra and analysis (differentiation and integration processes). It is developed by the University of Salzburg. The program won some awards like the German and European awards for educational software. It allows creation and dynamical change of constructions with points, vectors, segments, lines and functions. The user has an option to insert equations and coordinates by hand. The program has some additional characteristics as the possibility of working with variables, finding some derivatives and integrals, also commands like "root" and "extremum" are available for use. The worksheet is divided into two parts: "algebraic" and "geometric" window. The expression in the "algebraic" window corresponds to the object in the "geometric" window.

Geometer's Sketchpad

Size: 15 Mb

Platform: PC/Mac

OS: Windows/Mac OS

Additional requirements: JRE

Licence: paid

Official site:

http://www.keypress.com/catalog/products/software/Prod_GSP.html.

This is one of the most powerful programs for dynamic geometry. The possibilities of drawing the graph of a given function, of inserting buttons to control animations and of development of macros are the main characteristics, that are making this program so remarkable. Another advantage of this software is that the instructions are visible for the user and in this way the separate steps for the constructions are known for the user.

Geometrix

Size: 10 Mb

Platform: PC

OS: Windows

Licence: free

Official site: http://geometrix.free.fr/.

This program has built in constructions of the basic geometric objects. Some additional constructions are available such as in-circle, tangent line, perpendicular projection etc. The trace that is made by the figure, when it is moved, can be studied. Rotation and translation are also built-in constructions. Diagrams can be created and printed. Some of the general calculations can be performed – sine, cosine, square root, division, multiplication, perimeter and area of a given figure.

Geonext

Size: 5 Mb

Platform: PC/Mac

OS: Windows/Linux/Mac OS

Additional requirements: JRE

Licence: free

Official site: http://geonext.uni-bayreuth.de/.

Geonext is the only one of the programs for dynamic geometry, that is available in bulgarian language. Vectors, right polygon, arc, sector, translation, rotation, reflection, circumference through 3 points etc. are some of the available constructions. The main disadvantage here is that when it is needed to make calculations with length, areas etc. the user has to know how to write commands in XML syntax. Export in HTML is optional. In this process a band with instruments for manipulation of the construction is generated. This is an important characteristic of the program as in this way it is possible changes to be made on the sketch directly from the browser used.

Kig
Size: 11,2 Mb
Platform: PC/Mac
OS: Linux/Unix
Additional requirements: JRE
Licence: free
Official site: http://edu.kde.org/kig/.

This program has a very wide range of constructions and is very friendly user. Most of the options for the constructions and the way the objects are visualized are available through contextual menu. Kig offers built-in constructions that are not available in the other dynamic geometric software. These constructions are related to circumference, curves, axes and directrix, also sum and subtraction of vectors. The main disadvantage is that if calculations are needed, then the user must be good in programming. Geometric transformations such as rotation, translation, inversion, reflection are available.

Example for reflection on some of the programs mentioned above follows.
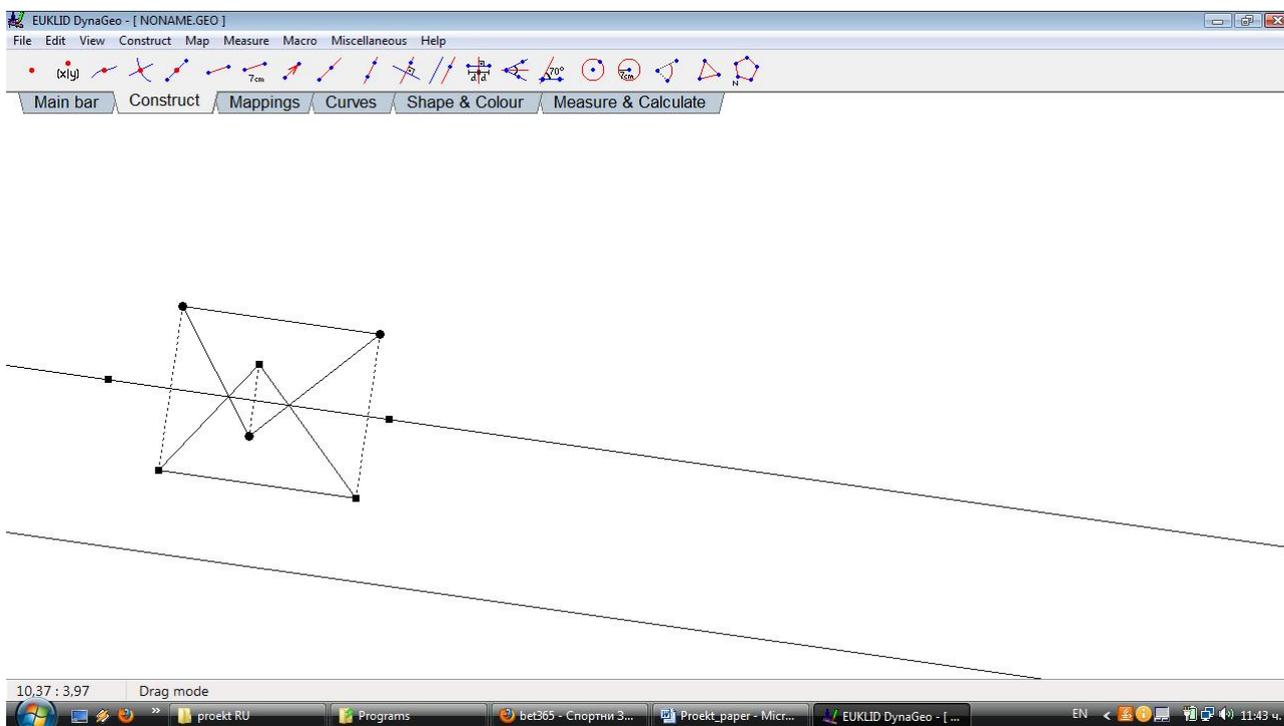
Euclid DynaGeo:

Figure 1.
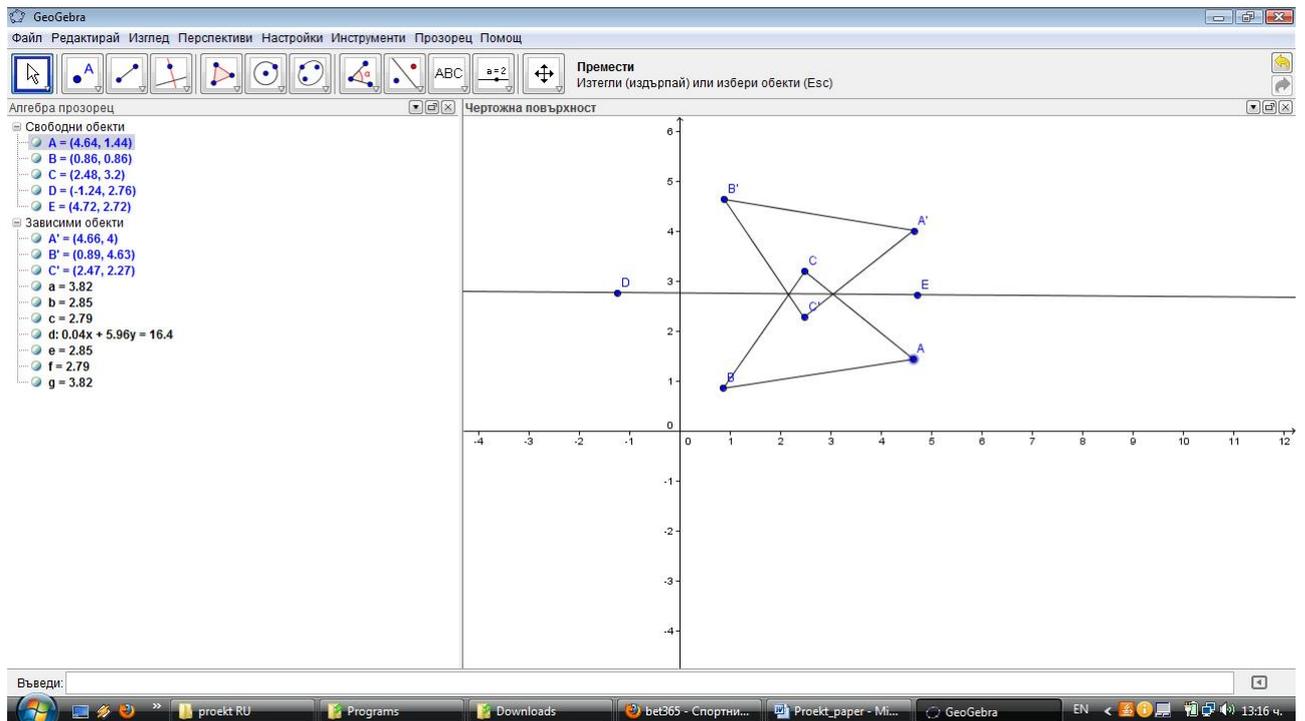
The same is made in Geogebra and it looks this way:
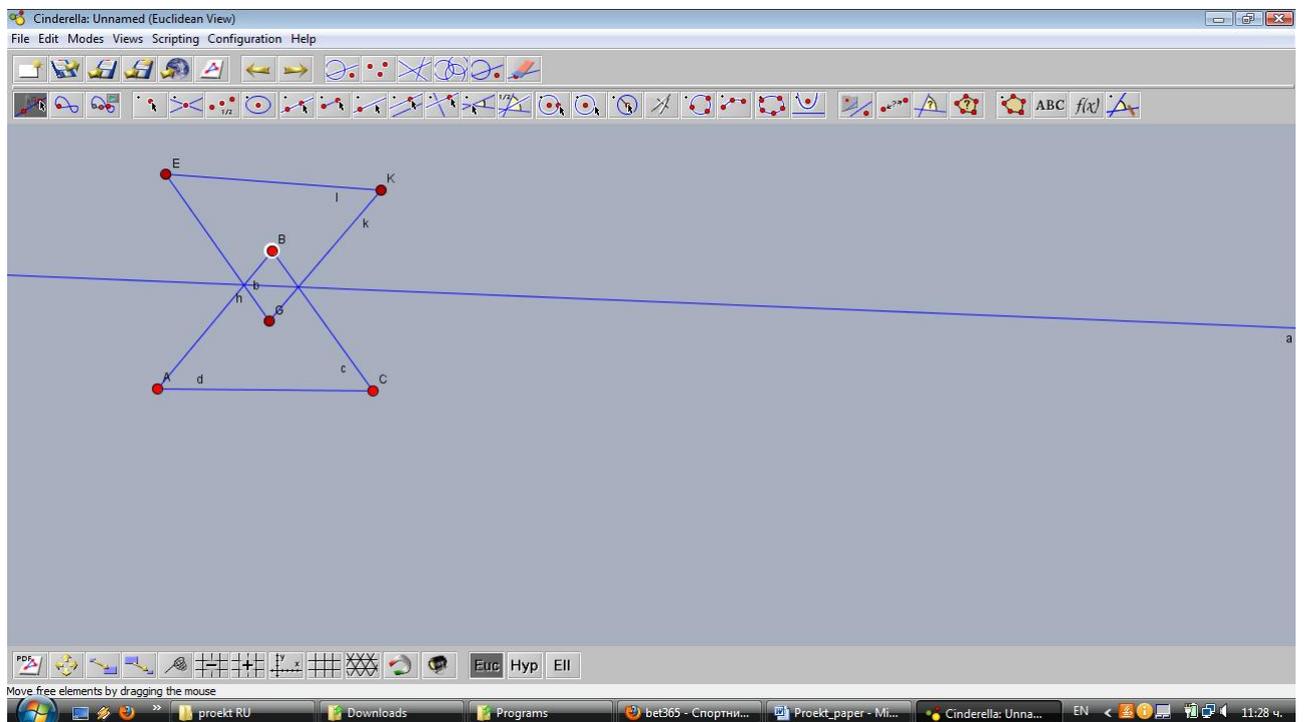

Figure 2.

And at last it is made on Cinderella:

Figure 3.

CONCLUSION

The great interest of students and teachers to the PC determines its use in the process of learning (teaching) as a strong and motivating argument for the implementation

of the purposes that are set. The work of the students in surrounding with PC provokes them to investigate purposefully, it develops their imagination. The advantages of the PC as an assistant of the teacher are indisputable. It expands, increases and enriches the presented subject, but the teacher has the leading role of an instructor, organizer and inspireror of the learning process.

REFERENCES
[1] Ташева, С., Д. Павлов. Иновации в технологията на обучение при професионалната подготовка. Национален институт по образование, С.,2000г.
[2] Trifonov T, M. Seebauer, New Strategy of Mathematical Education and Training Based on Computer Mathematical Systems, Proceeding of ITHET 2002, Budapest, 2002.
[3] http://techs-mobile.blogspot.com/2011/03/blog-post_15.html
[4]http://www.newteck.bg/computer/articles.php?issue_id=66&unit_id=601&article_id=1967

CONTACT ADDRESS
Assist. Mihail Kirilov, PhD
Department of Mathematics
Faculty of Natural Science and Education
Angel Kanchev University of Ruse
8 Studentska Str., 7017 Ruse, Bulgaria
Phone (++359 82) 888 623
E-mail: mkirilov@uni-ruse.bg

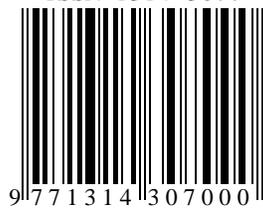# ИЗПОЛЗВАНЕ НА ДИНАМИЧЕН СОФТУЕР ЗА ЧЕРТАНЕ В ЧАСОВЕТЕ ПО ГЕОМЕТРИЯ

Михаил Кирилов

Русенски университет „Ангел Кънчев"

Резюме: Статията представя някои софтуерни продукти за динамична геометрия. Съвременният учител е принуден все по-често да използва в своята дейност и персонален компютър. Тези продукти позволяват създаването и променянето на чертежите, както и експортиране в HTML формат.
Ключови думи: чертеж, динамичен геометричен софтуер, геометрични построения.