

Faculty: Telecommunications and Management
Department: Information Technologies
Professional Field: 5.3 Communications and computer technologies.
Specialty: Computer technology
Educational-qualification degree: Bachelor

LEARNING COURSE DESCRIPTION

1.Course title:Computer vision

2.Course code: B.42.056.2

3.Type of the course: selected

4.Level: Bachelor

5.Year of study: 4

6.Semester: 7

7.Number of credits: 6

8.Name of the lecturer: Assist. Prof. Strahil Sokolov, Eng. PhD

9.Course learning outcomes:

The aim of the course is to give students in a systematic way theoretical and practical knowledge about the role of computer vision and the use of augmented reality in the modern world of ICT. Students who have completed their training in the discipline must have programming skills with the help of a modern development environment and practical skills for solving basic problems in computer graphics.

Students who have completed their training in the discipline must acquire:

Basic knowledge:

- Convolution, image filtering
- Resizing and separating features
- Recognition of signs, classifiers
- Neural Networks

Practical skills:

- Work with a modern platform for computer graphics
- Programming of medium-difficult and difficult tasks from computer vision with the OpenCV library

Competencies: Upon successful completion of the course students should be able to:

- to know the basic tasks and principles of computer vision;
- to know the basic principles of augmented reality;
- to create programs with OpenCV API for solving tasks of computer vision and augmented reality.

10.Teaching methods:

The method of teaching is through lectures, block or one lesson per week for 15 weeks and practical exercises in block or one lesson per week for 15 weeks.

11. Prerequisites:

Students should have prior knowledge of programming basics, and programming practice.

12. Course contents:

Introduction to computer vision and augmented reality are studied in the course. Fourier transform, Convolution and separation of contours, Image filtering, image resizing and pyramid representation. Separating features from an image. Segmentation and filters SIFT, HOG Comparison of image features. Comparison with a template. Geometric transformations of the image. Homogeneous coordinates Ransac algorithm Align images and motion patterns.

Linear, affine and projective transformations. Scaling and interpolation. Panoramic images.

Recreate a 3D scene from 2D images in single view and multi-view mode. 3D image processing Relationship between Virtual Reality and Augmented Reality. Introduction to image recognition. Probabilistic and statistical models. Clustering. Classifiers. Machines with supporting vectors. Convolutional neural networks. Structures and training. Methods and algorithms for Deep Learning

applications.

Summary. View additional applications of computer vision. Preparation for the final assessment of the subject.

13. Bibliography

Basic literature:

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Texts in Computer Science, Springer, 2012.
2. Nicu Sebe et. al., "Machine Learning in Computer Vision", Springer Science & Business Media, 2005.
3. Greg Kipper, Joseph Rampolla, "Augmented Reality: An Emerging Technologies Guide to AR", Syngress, 2012.

Additional literature:

1. Bernd Jähne, Horst Haussecker, "Computer Vision and Applications: A Guide for Students and Practitioners, Academic Press, 2000.
2. Steve Aukstakalnis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR", Pearson Education, 2016.

14. Assessment methods and criteria:

The course ends with an exam.

1.Requirements for the assessment of the six-point system

The total number of points from the written exam that can be reached is 100. Each of the questions in the final exam carries 3 points, and the answer to the open question can carry up to 10 points.

2. Formation of the final mark

The formation of the final grade is carried out on the basis of a point system as the maximum number of points that students can receive is 100 and can include various activities.

Forming an assessment in the training course at each of the above stages, according to the points obtained and their ranking according to the six-point system is given in Table 1.

Table 1.

Number of points	Assessment According to the 6-pointScale System
0 – 20	Fail 2 (F)
20 – 39	Fail 2 (FX)
40 – 49	Satisfactory 3.00 (E)
50 – 59	Satisfactory 3.00 (D)
60 – 69	Good 4.00 (C)
70 – 84	Very good 5.00 (B)
85 – 100	Excellent 6.00 (A)

15. Language of instruction:Bulgarian/English