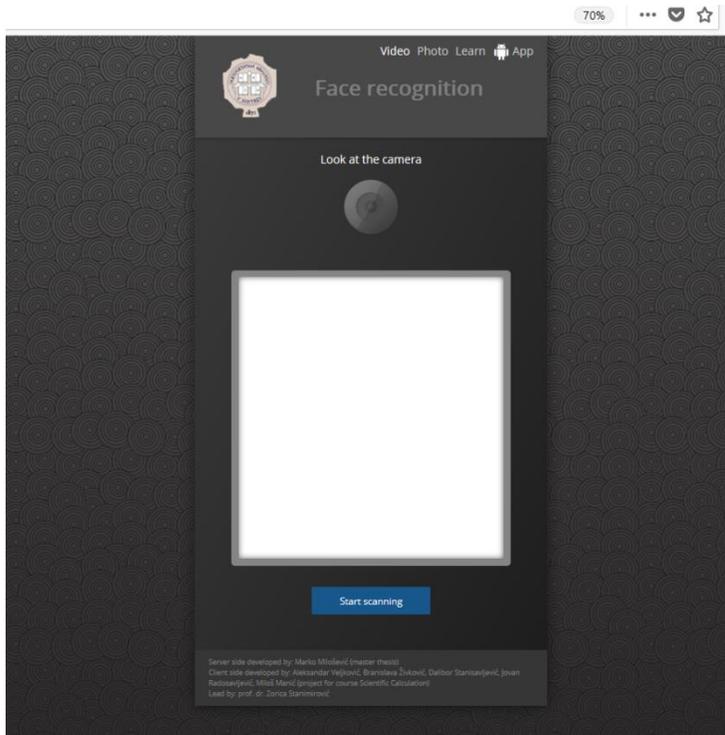Face recognition software

Facial recognition is a highly demanding task, which traditionally meant a certain degree of intelligence, which a person with relative ease fulfills, but it is not easy to transfer that logic to the computer, or implement it so it can be performed automatically with a high degree of precision. Among the most precise biometric methods are DNA analysis, fingerprint and pupil eye, but due to different limitations are not always applicable. The main advantage of the face recognition method is the ease of accessing information. In order to identify someone with the help of DNA code, fingerprint, or eye scanning, we first need to have such information in the database. Furthermore, each time we want to identify a person, it is necessary for the person to cooperate by taking a fingerprint, a DNA sample, or scanning the eye of the eye, and comparing the data thus obtained with the data in the database.

On the other hand, photographs have become very common material that is easily acquired and found, given the increasing coverage of public areas by cameras, and the distribution of photos on social networks and the Internet in general. The nature of the task of computer identification of persons enables us to, in the main, the easiest way to get the faces of a person of interest to us, much simpler than some other biometric characteristics. When providing a state border, a bank, a sports hall or other object of importance, it is possible to place the camera at the appropriate place at the entrance, and thus automatically obtain more quality photographs of each person entering the building without its active participation, and without stagnation.

Facial recognition is a biometric method that is experiencing expansion thanks to the capabilities of modern hardware, and serves to automatically identify and identify people based on digital photos of their faces. This is achieved by comparing the entered photo with digital photograph descriptions in the database. Note that face recognition, as a biometric method, can not be considered as absolutely reliable, but it is a very useful auxiliary tool used in combination with other information and databases that the security services possess in order to prevent security threats and detect perpetrators of crimes.

The starting point for research is the existing face recognition software, which successfully combines existing algorithms in this field, using the advantages of each of them in order to achieve the most accurate results. The software was developed in the framework of a joint project of the Faculty of Mathematics and the Faculty of Security of the University of Belgrade. In Figure 2.1. a simplified diagram of the used face recognition algorithm is displayed.

Web application software (Figure 2.2) is available at http://tocsearch.com/fr/. The Android application was developed (Figure 2.3), which is available at http://tocsearch.com/fr/app.html.

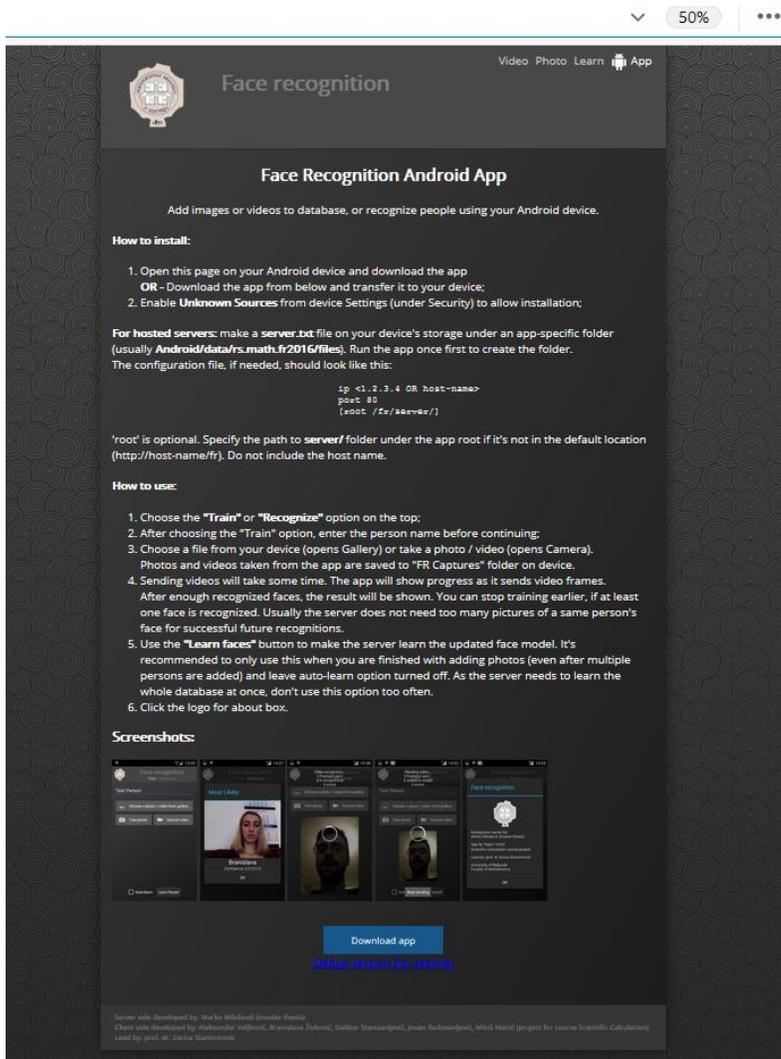Figure 2.2 Web application software for face recognition

Figure 2.3. Android face recognition software

Developed software has been tested on four baseboard photographs of different weights (faces94, faces95, faces96 and mites), which represent databases represent standard databases for face recognition software testing. As the developed software yielded exceptional results on these databases (99% confidence for the faces94 database, 97% reliability for the faces95 database, 95% reliability for the faces96 database, 100% reliability for the grimaces database), it gives us a good basis for continuing research with the goal further improvements. With adequate modifications and adaptations, the software can be used as a tool for assisting decision-making in various areas, among which the most important area of security.

Development Plan:

1. Improvements and modifications of the existing face recognition software in multiple directions, primarily in terms of accelerating execution time. Since the software uses a number of models and algorithms, it expects more disk space and memory in the computer, and the algorithm takes a little longer. Furthermore, it is necessary to provide greater system configurations. In particular, for different applications, different execution times should be provided; If reliability is not the most important, it should provide the user with the ability to balance between quality and performance. Optimizing results, implementing additional algorithms for each of the steps in identifying faces and shapes, and testing their effect on different bases.

2. Creating a photo base for user needs, in order for the software to respond to specific needs, and this set is used as the most important in the remaining testing of the solution. A database of objects (forms) is created that is of interest to the user, and tests the solution obtained.

3. Development and testing (in cooperation with the user) of the graphical interface and specifying a set of commands available from external services. Training users on concrete examples for the formation and testing of photo faces bases.

Planned application of face recognition software:

1. Integration into a video surveillance system of heavily accessible or inaccessible large territories (subproject 1) in order to detect, recognize and recognize persons taken from the drones.

2. Integration of the proposed software with the TOC-search database (Subproject 3), but also with some other, professional databases. Although the information provided by the proposed software has a high degree of reliability, only a combination of other methods and cross-checking with data from professional databases can provide a complete, reliable security system.

3. Implementation in the system for identification of persons, that is, the security system that serves the automatic provision of the passage of persons through the target points (passage, gate, gate) based on biometric characteristics. The end result is a software solution that in combination with an adequate gate or gate computer controls the passage completely autonomously while at the same time reliably controlling the passage of persons without the need to carry additional cards or keys that are vulnerable to loss or theft. The person whose identification we want to implement would be passed on to the passing point next to the camera that sends photos to face recognition software. i, If a person is identified, a pass is automatically approved, or an electronic lock is opened. If a person is not found in a database (in a relatively small number of cases), it could be authenticated by the basic method, by fingerprinting, or by entering the code. A faster flow would be achieved, without slowing down, since without user interaction it would be possible to authenticate a person in a large number of cases. Any

successful and unsuccessful attempts to pass people would be recorded in detail with the video and available to the system administrators.

Object recognition software

The software solution planned by this project implies a system that, with adequate training data, can classify types of objects (for example, vehicles, housing or other objects, weapons) or forms with high precision, depending on the quality of the input information.

The product obtained would be a service suitable for integration with various protection systems and databases, easily accessible and made so that it is easily adapted to the various new requirements that these external systems bring.

The basic user interface implies visual access to the options for making training data sets (for example, the base of photo shapes whose recognition we want to achieve or objects), as well as the option of classifying the next photo from a camera image, or from an already available file from a disc or a global computer network.

The user receives a precisely documented set of commands provided by the service, which as a result facilitates the implementation of the connection with any other specialized software.

It is planned that this solution will allow easy integration of additional algorithms (if they bring the sensible advantages), which in the meantime appears in the framework of world research into this problem, which is very common in view of the current topic in the scientific context.

Planned application of Object recognition software:

1. Implementation of the basic algorithm with simple optimization of input data (processing and correction of data quality - photography). After this phase, testing of the solution obtained is performed, and the comparison of results obtained by different algorithms and optimization procedures.

2. Optimization of results obtained in the first stages of the project. Additional algorithms are implemented for each of the steps in identifying objects or shapes and testing their effect on different bases. In parallel, a database is developed for user needs, in order to better match the software to specific needs, and this set is used as the most important in the remaining testing of the solution. It begins with the implementation of the modification of the used algorithms in order to identify objects and perform the first tests.

3. Optimizing performance and precision algorithms for identifying objects or shapes. A database of objects (forms) is created that is of interest to the user, and tests the solution obtained. Parallel development, in cooperation with the user, graphic interface and specifies a set of commands available from external services. Users are trained with specific examples and provide help and guidelines for the formation and testing of photo objects (shapes) bases.

Planned application of face recognition software:

1. Integration into a video surveillance system of heavily accessible or inaccessible large territories (subproject 1) in order to detect, recognize and recognize objects and shapes taken from the drone