Mobile Modular Center for Crisis Management of International Migration[1]

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Nowadays, the global situation is heavily affected by the two crise factors. Firstly, the health and economy crisis based on the COVID-19 pandemic, and secondly, military and human crisis with the strong influence on the global economic situation caused by the situation in Ukraine. Considering the impact of the global situation and the established processes, new approaches to the border management should be set.
In this work the new issues of international border regulation and the consequential impact on performed border controls and management are discussed. The new realization platform of border controls based on the introduced Mobile modular center for crisis management of international migration is presented. The variable cluster design of mobile, modular, testing and evaluating units was proposed. Our presented research in this area reveals the advantage of using the technologies of artificial intelligence algorithms for management of national and international borders. The new realization platforms of border controls based on the introduced mobile module testing and evaluating center are able to be offered for EU members or FRONTEX.

Keywords: border control; health check; cooperation; crisis management; mobile module

I. Introduction

The current global health, migration and security crisis have brought new issues in the field of Europe Union Member States and their borders regulation. The COVID-19 pandemic directly impacts the healthcare of citizens in countries worldwide. Unregulated travelling, migration and crossing the internal (in our case Schengen) or external country borders present high risk of uncontrolled spreading of various diseases. Therefore, crossing the external borders is highly ranked subject of the new EU legal regulation. Moreover, these effects are multiplied by a new wide-spectrum crisis in Ukraine that developed from military to human, health, economical, energy and migration crises. These factors mixed show potential to affect everyday lives of all the people in Europe.
As a result, new partnerships, cooperation, business models, organizations and markets have been changed. These facts lead to wide deployment of new legal regulation. Therefore, new international border regulation and consequential impact on performed border control are also widely discussed. In this way the situation leads to new issues in the field of entering Slovakia and EU. This work solves the problematics of border control automation and security using Mobile modular center for crisis management of international migration. The general aim of the proposed modular center is to design an optimal set-up and system arrangement containing a precisely specified series of

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necessary workplaces providing a high degree of variability and configurability into the required functional cluster. Depending on the nature of the crise situation (a natural disaster, a major industrial accident, a pandemic, a migration wave, a state of threat, a state of war, etc.), it is possible to build an ideal complex of the workplace modules for management, control and diagnostics of people in the most optimal geographical location in relation to the currently solved crisis. This complex testing and evaluating units aim to minimize the physical contact of passengers or immigrants and border guards (police officers) deploying modern intelligent sensors and systems. These facts result in the need of integral management of EU borders upgrade. This article is an integral part of the scientific research project VÝSK. 257: Mobile data collecting and analytical center for management of crise situation of the Academy of the Police Force in Bratislava (Slovakia).

II. Present regulation connected to borders

Basically, the border checks mean the checks carried out at border crossing points, to ensure that persons, including their means of transport and the objects in their possession, can be authorized to enter the territory of the Member States or are authorized to leave it. On entry and exit, third-country nationals shall be subject to thorough checks.
The conditions of internal borders and external borders involving the entering process of the third-country nationals to territory of the EU Member States (including the Slovak Republic) have been fixed by the Regulation (EU) 2016/399 of the European Parliament and of the Council[4].

1 Based on the valid legal regulation, mandatory preventive checks are appertained not only to the inhabitants of the Slovak Republic, but mainly to foreigners entering the territory of the republic. In current epidemiological situation more strict requirements and preventive health checks against the introduction of communicable diseases are needed to ensure health protection.[5]

A New legal regulation of borders

The COVID-19 pandemic directly impacts the healthcare of citizens of any country. Unregulated travelling, migration and crossing the internal (Schengen) or external country borders present high risk of uncontrolled spread of the disease. This is one of the reasons that crossing the external borders is subjected to the new EU legal regulation connected to New Pact on Migration and Asylum. Based on a holistic assessment, the Commission is proposing a fresh start on migration: building confidence through more effective procedures and striking a new balance between responsibility and solidarity. Migration affects Europe as a whole and all Member States must play their part to address the challenges and opportunities that it brings. To foster confidence and guarantee a well-functioning EU migration management system, the Pact sets out a new framework that ensures fair sharing of responsibility and solidarity between Member States while providing certainty for individual applicants. Several basic points are specified: new compulsory pre-entry screening; new, faster asylum border procedure; integrated and modern migration and border

[4] Regulation (EU) 2016/399 of the European Parliament and of the Council of 9 March 2016 on a Union Code on the Rules Governing the Movement of Persons Across Borders (Schengen Borders Code) (codified version).
[5] Kuľková, Jana, 2022. *Právna analýza umiestňovania technických prostriedkov na hraniciach počas a mimo krízovej situácie*. (Bratislava: Projustice.sk, 2022).

management system with the improved Eurodac database; legal guarantees[6]. Mostly the part with the new compulsory pre-entry screening is highly innovative in the management of borders.
According to New Pact on Migration and Asylum, the point of the new compulsory pre-entry screening is based on the key processes of: Identification, Health checks, Security checks and Fingerprinting and registration in the Eurodac database. Considering the impact of these key processes, mainly Heath checks performed during border control, new partnerships with the sectors of medical and pharmaceutical care are essential. Therefore, one of the most important issues nowadays is to set fast and effective cooperation between members of border guards (Ministry of Interior of the Slovak Republic, Academy of the Police Force), members of medical and pharmaceutical care (Ministry of Health of the Slovak Republic, Medical and Pharmaceutical Universities) and business entities (producers of medical and pharmaceutical products, materials, technology, vaccines, etc.). Proposed cooperation setting for new border control management is depicted in Figure 1.

Figure 4: Upgraded cooperation scheme for border control management according to the new standards with proposed data flow diagram via crypto tunnels and central data center.

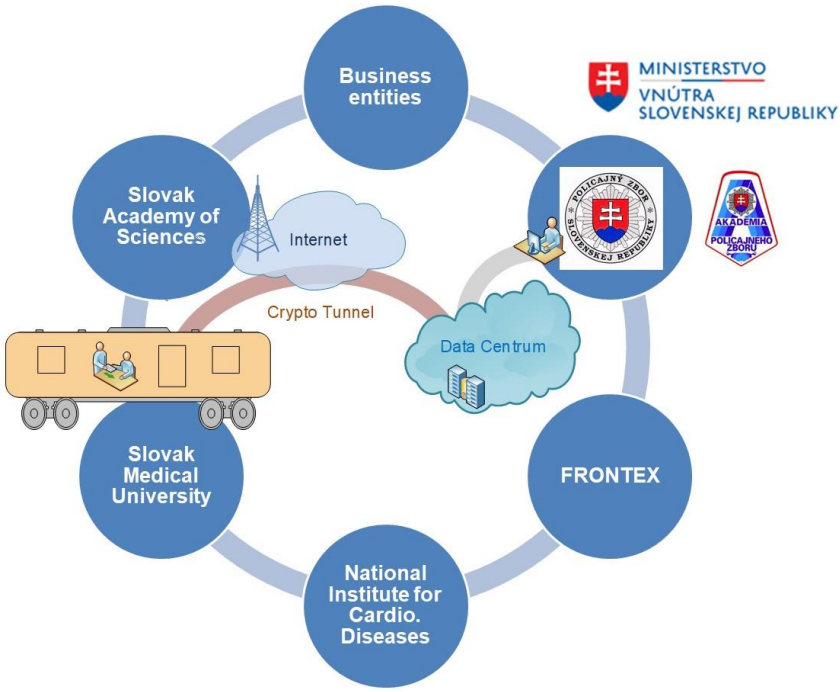

Figure 1 is enlarged with the suggested data flow diagram using the central data centrum and dedicated access for specialists and border guards or other police officers in remote areas (offices, hospitals, laboratories) through the created set of crypto tunnels. This solution offers extended tool for the presented police officers or army officers directly in the area of the borders. Generally, skilled and experienced specialists in their local facilities are going to use their best practise to evaluate each case needed and remotely provide results of the innovative border placed checks via secured data connection. In the case of health check, the role of the border officer is to set the exact

[6] The website of the European Union: https://ec.europa.eu/info/strategy/priorities-2019-2024/promoting-our-european-way-life/new-pact-migration-and-asylum_en (date of access: 5th February 2021)

position of subject for correct measurement and subsequent selection (positive/negative) under the remotely approved results of the artificial intelligence by the specialists in radiology and medicine.

III. Proposed border anagement

The problematic of the heath checks during border control is innovative and need new realization platforms and complex legal regulation[7]. Proposed mobile module testing and evaluating center was first time introduced in the Science and Technology Week in the Slovak Republic, intended for integrated border management, temporary reintroduction of internal border controls, management of the mass unregulated migration and critical situation overcoming seems to be highly suitable to meet the new criteria of the Pact on Migration and Asylum and also for the FRONTEX[8] joint operations.

Automation processes will be set to optimize the intensity of the physical contact between passengers / immigrants and border guards (police officers). Modern methods based on the intelligent sensors[9] and smart systems with direct but also with sophisticated remote evaluation will be performed to reveal subject risk (or security) potential. The widened potential of the mobile module testing and evaluating center for border control management consist of:

- Capture of potentially dangerous subjects using non-contact temperature measurement and indicative laboratory diagnostics from blood and swabs.
- Diagnosis of pulmonary diseases symptoms like COVID-19 using radiological examination of lungs and accelerated identification by implementation of artificial intelligence elements involved in automated evaluation of processed data.
- Capture of entities crossing the border giving false information about their age or state of health, with a focus on possible pregnancy or presence of foreign objects in hollow organs.
- Remote assistance of specialists confirming the data analyses in remote specialized offices and laboratories.
- Operational change in the filtration of risk subjects based on a change in the range of parameters of border control and a change in the range of parameters of diagnostics and screening of the health/medical condition of subjects.
- Minimization of risky personal contacts in the process of data collection, analysis, and subsequent evaluation. Application of cognitive functions of neural networks can eventually lead to full autonomy in evaluating data.
- Optimization of European border management processes.

[7] Decree No. 585/2008 Coll. of the Ministry of Health of the Slovak Republic, which defines details on prevention and control of communicable diseases

Act No. 355/2007 Coll. On protection, encouragement and development of public health and Amendment and Supplementation of Certain Acts.

Act No. 404/2011 Coll. on Residence of Aliens and Amendment and Supplementation of Certain Acts.

[8] The website of the European Border and Coast Guard Agency: https://frontex.europa.eu/, (date of access: 6th February 2021)

[9] I. Kosc et al. Sputtered TiO2 thin films with NiO additives for hydrogen detection, Appl. Surf. Sci. 269 (2013) 110–115 (2013: 2.538 - IF, Q1 - JCR Best Q, 1.045 - SJR, Q1 - SJR Best Q)

I. Kosc et al. Double layer films based on TiO2 and NiOx for gas detection, Appl. Surf. Sci. 312 (2014) 120–125 (2014: 2.711 - IF, Q1 - JCR Best Q, 0.948 - SJR, Q1 - SJR Best Q)

A Usability of the system by Frontex

Frontex, the European Border and Coast Guard Agency, promotes, coordinates and develops European border management in line with the EU fundamental rights charter and the concept of Integrated Border Management. In the past was by the Council Regulation (EC) 2007/2004 of 26 October 2004 established the European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union (Frontex). This Regulation was repealed by Regulation (EU) 2016/1624 of 14 September 2016, establishing Frontex, the European Border and Coast Guard Agency. The latest amendment of the Frontex mandate occurred when the Regulation (EU) 2019/1896 of 13 November 2019 on the European Border and Coast Guard (OJ L 295, 14.11.2019, p. 1) came into force.[10] Frontex coordinates operational cooperation between Member States in the field of external border management, assists Member States in the education and training of national border guards, conducts analyses, monitors research developments, assists Member States in situations that require increased technical and operational assistance at external borders, and provides the necessary assistance to member states in organizing joint operations in cases of return of persons. Frontex works closely with other partners of the European Community and the European Union who are responsible for the security of the external borders.[11]

In recent years, the external borders of Europe have seen an unprecedented influx of refugees and migrants who wanted to enter the territory of the European Union. Controlling the external borders of the European Union is the responsibility of the countries on whose territory these borders are located. However, Frontex can provide additional technical support for European Union countries that are facing large pressures from migrants. For this purpose, Frontex coordinates the deployment of additional technical equipment (such as ships and planes) and specially trained border guards.[12] In our opinion, the mobile modular testing and evaluating center developed by us is a suitable technical equipment for providing assistance to member States during migration crises. Therefore, our goal is to offer this technology as a ready-made solution for EU states through FRONTEX.

IV. Mobile modular testing and evaluating center

The aims of this project can be specified and descibed in following steps:

1) Design, development, and automation of a mobile module control, testing and evaluating center for the analysis and collection of data from modern sensor systems intended for the management of the European borders.
2) Provision of possible technical solution of mobile modular system that includes all necessary workplaces with a high degree of variability in the mutual configuration leading into the required functional center.
3) Recording of the sensory responses to specific stimuli depending on the current requirements and types of needed tests.
4) Real-time data collection, storage, and eventual transfer of collected data to remote locations.

[10] The website of the European Border and Coast Guard Agency: https://frontex.europa.eu/, (date of access: 28th September 2022)

[11] Denisa Szajkóová, *Možnosti účasti príslušníkov Policajného zboru na vyslaniach Európskej agentúry pre pohraničnú a pobrežnú stráž a zahraničnej jednotky Úradu hraničnej a cudzineckej polície Prezídia Policajného zboru.* (Bratislava: Akadémia Policajného zboru v Bratislave, 2020).

[12] Ibid.

5) Local analysis of the obtained data and subsequent evaluation of the subject's safety or risk level.
6) Centralization of data and subsequent division and distribution to location of designated highly qualified experts for further analysis and evaluation. Case closing after all necessary outputs recollected and reevaluation of safety or risk subject potential.
7) Operational change in the filtration settings, dedicated to considered risks, based on a change in the range of parameters of border control and also in the range of parameters of diagnostics and screening of the health or medical condition of subjects.

A Proposed mobile modular testing and evaluating center platform characteristics

Project base point represents mobile platform for the mobile modular testing and evaluating center. This mobile platform can be designed in several mutations according to the possibility of easy transportation. The final solution is platform in the specific design of mobile trailer or customized mobile containers. All the variations needed should be possible to get to final destination by all means of standard transport systems (vehicle, train, boat and plane transport).
The implementation stages are discussed in the way of basic or general implementation stage and the exact implementation of the project. The basic or general implementation stage is suggested as a variable cluster of units based on the provided platform suitable for effective transportation and subsequent fast center construction in a specified location. The designed cluster necessarily consists of a main check unit and security corridors, a documents' control unit, energy and supply modules unit, an ambulance unit and specialized units. The exact implementation of this project is aimed to the eastern border of the EU and for the Police departments, Ministries of interior and Ministries of defence of the Eastern border EU Member States. In the current Ukrainian situation, the exact project implementation is a matter of the National and Eastern EU security issues. The exact implementation and the exact cluster layout depend on the actual deployment regime and character of crisis.

(i) Validation study of artificial intelligence system

Great benefits are expected to be brought using artificial intelligence in automation processes. Medical part of this project is focused on the analysis, collection and evaluation of data and results, implemented to promptly address and provide a screening program for the diagnosis of pulmonary diseases symptoms for example like COVID-19. Radiological examination of lungs is one of the basic procedures of medical irradiation performed by a radiological technician. Artificial intelligence is used in the automatic and accelerated identification and health care of high-risk persons crossing the borders of the Slovak Republic. The records of examinations will be kept in a form that allows statistical evaluation of the radiation exposure of the individual in accordance with the requirements of protection against ionizing radiation. (Decree of the Ministry of Health of the Slovak Republic No. 99/2018 Coll. On the provision of radiation protection, NV No. 87/2018 Coll. On radiation protection). This project uses the modern mobile X-ray device Fujifilm FDR Nano (Fig. 2) equipped with integrated artificial intelligence Fujifilm REiLI, Lunit INSIGHT CXR3 ver. 3.0.0.1 analytical algorithm, irradiation side sampling, virtual grid, hydro Ag anti-bacterial surface, flexible control panel and Fujifilm Synapse PACS.
In this place, it is also necessary to mention, that the Slovak legal framework is in compliance and harmonized with the European legal framework.
In this work the performance of a chest X-ray system with artificial intelligence REiLI was tested and evaluated. Specifically, the system detecting the presence of atelectasis, calcifications, cardiomegaly, consolidation, fibrosis, mediastinal enlargement, pulmonary nodules, pleural

effusion, pneumoperitoneum, and pneumothorax. During the validation study of artificial intelligence REiLI very promising results were obtained. Patients hospitalized in the National Institute for Cardiovascular Diseases in Bratislava, mostly suffering from cardiac diseases were included in the study. This group of patients usually exhibits abnormalities on the X-ray especially in the configuration of the heart and pulmonary vascularization. Many of the patients have postoperative complications as pneumonia or conditions associated with heart failures. This spectrum of patients is very promising training sample for the validation study of artificial intelligence based on Fujifilm REiLI program. Each X-ray image result evaluated by the REiLI system was afterwards evaluated and checked by experienced radiologists. For the purpose of our scientific research project VÝSK. 257 of Academy of the Police Force in Bratislava the total amount of 560 examinations (X-rays) have been carried out.

Picture 1: Use of artificial intelligence in automatic diagnosis of pulmonary diseases using X-ray of lungs.

The observed pathologic findings, which had a high prevalence in the group of 560 examinations, were identified by the system implying the artificial intelligence with a high degree of success. In these cases, the agreement of the artificial intelligence results with the true reality of radiologist's opinion consensus was very good. The efficiency of the artificial intelligence algorithm decreased mostly for the atypical findings on X-rays, especially in the summation of parts of medical devices in the bodies, which is not normally the case of border regime subjects. The morbidity of examined group of patients is testified by the fact that only 16 examinations (from 560) in our group had an X-ray image of the chest completely without pathologic findings. For all patients with a normal chest X-ray image (healthy subjects), the agreement of the consensus of radiologist's opinions and the artificial intelligence algorithm was absolute. This result together with the measured average time of the artificial intelligence evaluation of about 20 s per subject are very promising results for the proposed mobile modular center for crisis management of international migration and new border regime

V. Conclusion

New needs of integral EU border management lead to innovative solutions in border control optimization. Novel mobile module testing and evaluating center was introduced. Automatic smart processes will be set to minimize the intensity and maximize the effectivity of the physical contact between members of border control. In the COVID19 era and the post-COVID19 era much bigger effort to follow strict health standards and rules is expected. New concepts based on intelligent systems, smart sensors and artificial intelligence are tested to bring more precise and selective outputs. This way seems to bring very satisfying results. Training sample of 560 chosen patients of the National Institute for Cardiovascular Diseases in Bratislava was able to reveal very promising results for implementation of artificial intelligence systems to the proposed mobile modular testing and evaluating center. Important results of the realized validation study of the artificial intelligence Fujifilm REiLI focused on the chest X-rays were obtained in the way of very fast evaluation (about 20 s per subject) and very effective selection of patients with negative findings (healthy patients). These findings can be marked as very promising for the crisis management of international migration and border regime.

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VII. References

Act No. 355/2007 Coll. On protection, encouragement and development of public health and Amendment and Supplementation of Certain Acts.

Act No. 404/2011 Coll. on Residence of Aliens and Amendment and Supplementation of Certain Acts.

Decree No. 585/2008 Coll. of the Ministry of Health of the Slovak Republic, which defines details on prevention and control of communicable diseases

Kosc, Ivan, I. Hotovy, T. Roch, T. Plecenik, M. Gregor, M. Predanocy, M. Cehlarova, P.Kus, A. Plecenik, *Double layer films based on TiO2 and NiOx for gas detection,* Appl. Surf. Sci. 312 (2014) 120–125 (2014: 2.711 - IF, Q1 - JCR Best Q, 0.948 - SJR, Q1 - SJR Best Q)

Kosc, Ivan, I. Hotovy, V. Rehacek, R. Griesseler, M. Predanocy, M. Wilke, L. Spiess, *Sputtered TiO2 thin films with NiO additives for hydrogen detection*, Appl. Surf. Sci. 269 (2013) 110–115 (2013: 2.538 - IF, Q1 - JCR Best Q, 1.045 - SJR, Q1 - SJR Best Q)

Kuľková, Jana, 2022. Právna analýza umiestňovania technických prostriedkov na hraniciach počas a mimo krízovej situácie. *In: Projustice - Vedecko-odborný internetový recenzovaný časopis pre právo, spravodlivosť a bezpečnostné vedy.* [online]. Bratislava. [cit. 30.9.2022]. ISSN 1339-1038.

REGULATION (EU) 2016/399 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2016 on a Union Code on the rules governing the movement of persons across borders (Schengen Borders Code) (codified version).

Szajkóova, Denisa, *Possibilities for members of the Police Force to participate in missions of the European Border and Coast Guard Agency and the foreign unit of the Office of the Border and Foreign Police of the Presidium of the Police Force*. Policajná teória a prax, 2020, No. 4, ISSN 1335-1370

The website of the Europe Union: https://ec.europa.eu/info/strategy/priorities-2019-2024/promoting-our-european-way-life/new-pact-migration-and-asylum_en (date of access: 28th September 2022)

The website of the EUROPEAN BORDER AND COAST GUARD AGENCY: https://frontex.europa.eu/, (date of access: 28th September 2022)