**An application of the Phygital concept in smart cities**

It is stated that the population of the Earth is above 8 billion now. The WHO claims that 16% or 1.3 billion of us are disabled people. Furthemore, more than half of the impaired people live in cities. The key to making their lives easier are smart cities. According to IBM, smart city means an urban area where technology and data collection help improve quality of life as well as the sustainability and efficiency of city operations. Technologies are the heart of this city type. The question is what can be done to alleviate the situation of the disabled people. The answer is the Phygitial concept.

Phygitial concept was coined by Chris Weil in 2007. According to marketing dictionary of Monash University, it is defined as a bridge between the digital world and the physical world with the purpose of providing a unique interactive experiences for the user. The most famous example of the concept being implemented is the Pokémon go. It is an app where people need to catch Pokémons using their smartphone’s camera and GPS in order to increace their collection. The game, created in 2016, still has about 90 million active users in 2024.

One of the challenges in implementing the phygital experience is working with old buildings that require refurbishment to meet the needs of the disabled. A case worth noting is implementing Phygitial experience in such an aged building is New York’s underground, first operated in 1904. In 2020 the Transit Tech Lab launched startup competition, where they chose 9 companies to implement upgrades in accecebility. Among them was Okeenea Digital with its audio-based indoor navigation app Evelity. It is adapted for all type of disabilities and can easily build a best route regarding vulnerabilities of person. Thus undeground was equipped with beacons to level up accessibility even more. The field of interests of Okeenea Digital covers not only underground or transport but also includes: workplaces, universities, museums and hotels. §

Tactile Studio was founded to specialise in designing educational solutions enhanced by sensory experiences – touch, sound, smell… The Tactile studio promotes a phygital concept through the idea of the interactive hybrid between physical (gestures) and digital (screens). It requires programming, modern electronics, 3D modeling and involving the leading experts. One of their greatest projects was visualizing 16 stations creating a tactile trail at the Pavilion de I’Horloge at Louvre. On the path the visitors can find archaeological elements and identify the specific period to which it belongs and the explanation of the decorative elements. In this case the “sentive” console with infrared sensor are placed in every room allowing interaction by passing their hand over the it to light up the corresponding room. The Tactile studio provides a comprehensive experience with audio devices and Braile text. Louvre is equipped with video materials with sign language specifically for hearing impaired people.

TUAT corp. – company that makes significant progress in creating application for visually impaired people. They introduced artificial intelligence in their application “Sullivan+” in order to recognize and vocalize objects from photos. It helps blind and low-vision individuals experience the phygital concept and understand what is around them. Implementation of the AI makes this app accessible all around the world, not depending on a particular city or country. Furthermore, Sullivan+ makes it easier to get acquainted with a new person because of the built-in Face Recognition that can identify the age and gender. Color recognition supports single-color mode, that describes what color is in the center of the photo, and full-color mode, that indicates what color covers a large part of the entire screen. Alongside that, the Light Brightness function helps the visually impaired people facing problems with understanding how bright it is around them.

Lazarillo is the application that solve a problem with commuting for disabled people in the Smart city. It is aimed at navigation through audio that alleviates problems of visually impaired. As a person walk, Lazarillo will announce places of interests, streets, intersections, restaurants, shops and transit areas. Applications like Lazarillo are easily-implicated in Smart cities because there is no need in refubrishment, only Big Data.

Ukraine promotes phygital concept in the smart cities too. For instance, in Lviv there is a project that allows the impaired people to do sightseeing. It was introduced in February 2024. it includes more than 100 places for visitors with different types of disabilities making lives of tourists and citizens more inclusive. Restaurants, hotels, museums, administrative buildings, libraries, hospitals, parks and places for entertainment are listed. “**Accessible City**” map is supported by the city council making this project a state supported one. The extension to the Google maps is developing constantly and is available on any device and has convenient search by categories to improve the experience.