

SUMMARY

The present work was designed to transfer the educational process, namely, the conduct of Laboratory works on Pneumatics, into the form of a virtual gamification experience. To accomplish this task, the work is integrated into the Educational Game Project developed by the Virtual and Augmented Reality Laboratory at Tallinn University of Technology. Originally, the gamification experience was inclusive of a 3D model of the University and a customizable avatar that could move around in a virtual environment. The model of the Pneumatics and Hydraulics Laboratory has not yet been built, thus a student can acquire access to the Laboratory works in the Virtual and Augmented Reality Laboratory.

On the occasion of entering the virtual environment, which represents a 2D gamification experience, a user observes the "*Main Menu*", which consists of subject selection between Pneumatics and Hydraulics, as well as a return to the 3D Laboratory. At the time of subject selection, a list of numbered Laboratory works appears, access to which opens exclusively in case the previous task is completed successfully. At the opening of the Laboratory work, the student observes the task in text format on the top of the screen, the Inventory of Pneumatics symbols, and the designated place for the schematic composition. The objective is to select the necessary components, transfer them to the schematic and build connection lines. For building connection lines, the "*UI Connect*" Asset is purchased from the Unity Asset Store and applied as a pattern. The connection line represents a Z-shape line, which is determined by 4 control points in order to improve the appearance of the circuit, and each connection line stores information about the nodes between which the connection is created. Laboratory works are developed hereby two UI buttons are located in the left corner of the schematic that allows to destruct connection lines or revert the work to its initial state. In addition to that, two buttons are placed at the bottom, one of which allows the withdrawal of the gamification experience, while the second is utilized to ascertain the composed schematic for correctness. The verification algorithm is that for each Laboratory work, a list of correct connections is initially created in the format of connected nodes, and once each connection is built, the student will be able to observe the prerecorded educational video. The educational videos are inclusive of an illustration of the components that are necessary to assemble a circuit as well as the process of composition and execution. These videos are implemented thereby the student can not merely compose a theoretical schematic, but also study the construction process in a real Laboratory. In case the schematic is not assembled correctly, the user observes a window with the corresponding information. Upon

successful completion of the designated task, access to the subsequent Laboratory work acquires and the student can revise the progress accomplished.

Henceforth, the Laboratory work on Hydraulics should be included in the project, following the extant algorithm. Additionally, the preservation of the existing progress should be saved at each withdraw from the gamification experience in order not to mislay the progress obtained.