

## Implementation of KYPO Security Exercise Management and Control Tool

The goal of this bachelor's thesis is to implement control and management tool for security exercises in KYPO project. This will allow better handling and management of exercises. The management tool will be able to change its functionalities based on the permissions of the user. The application will be deployable as a portlet into Liferay enterprise portal, and will have established communication with the extended network topology editor.

## Implementing a Complex Event Processing C++ Client for T-Rex

The need for Complex Event Processing (CEP) involves processing a large amount of data, identifying composite events and reacting according to the detected situation. T-Rex, a CEP middleware, currently uses a C++ server and a Java command line client. The aim of the thesis is to analyze deficiencies of the outdated Java client and apply that knowledge in designing more secure, faster interface written in C++ language.

## Visualization of video data through UltraGrid using Vulkan

It is common to use OpenGL to visualize video streams so SITOLA lab other institutions use it quite a lot. Since the release of Vulkan few years ago, it has been just a matter of time when will SITOLA try to test its video protocols in this younger successor of OpenGL. In my work I try to make more efficient script while using UltraGrid, software for low latency and high quality video network transmission, to render images as textures in Vulkan and hopefully reach better efficiency compared to OpenGL.

## Review Tool Component for the Kontr 2 Automated Homework Evaluation System

Kontr 2 is a new system developed at the Faculty of Informatics, Masaryk University, which enables automated homework submitting and evaluation. This thesis aims to introduce the system's new front-end component, the Review Tool. The primary purpose of this component is to allow displaying submitted code and adding critical reviews from evaluators. The tool also provides an interface to display the results for each executed test, statistics of the test suite, outputs generated by the executed binaries, and logs. In addition to that, the Review Tool enables comparing syntactic differences between files and writing submission assessments into the Information System notebooks. This work describes the component's design and implementation using the Angular framework, as well as its deployment and usage in programming courses at the Faculty of Informatics.

## Using Docker in a production environment

The goal of this thesis is to provide a system administrator at a small or mid-sized organization an overview of fundamental concepts of the containerized environment, point out the frequent challenges faced during the implementation and day-to-day use of the environment, and propose a set of best practices so that the organization can take advantage of the benefits of running containerized application while minimizing the effects of the current drawbacks.

## Current state of the thesis:


The main parts and overall composition of the thesis were consulted with the supervisor and one of the chapters has gone through the first review (for factual accuracy rather than specific wording). As the reference cluster was tested successfully, the supervisor agreed that most of the theoretical part would be done in the next semester with the possibility of having one of the chapters reviewed earlier (this semester) if I manage to complete it earlier.

## Automate issue tagging and categorization using machine learning techniques

Nearly any project needs to handle its issue queue at some point and categorize/tag them to drive various issue management processes. The tagging/categorization itself is usually a manual work. The objective of this project is to explore the possibility of using machine learning techniques to automate this task and implement it into functioning application.

~~(Popis postupu práce)~~ Creation of simple java application with user interface, where user imports the data to be parsed, data being issues. Implementation of backend functionality, which can by using machine learning techniques, categorize/tag issues and store them in database, later to be easily found or grouped by search queries.

## Reimplementation of LCSD-SLAM algorithm (Not in “IS” yet)

The goal of my thesis is to re-implement algorithm LCSD-SLAM used in robotic vision to more effective and clearer version. Simultaneous localization and mapping (SLAM) is the computational problem of constructing or updating a map of an unknown environment while simultaneously keeping track of an agent's location within it. There are two main approaches 

to SLAM: **D**irect SLAM that compares entire images to each other and feature-based SLAM that compares corners and other features. Loosely-Coupled Semi-Direct Monocular(LCSD) SLAM combines the additional power of feature-based and direct SLAM that enables to perform multiple levels of parallel optimizations in real time. This technique was able to beat most of both strictly direct and strictly feature-based algorithms in accuracy and robustness.

## Zip Trees

Zip trees are randomized self-balancing binary search trees which use merging and unmerging paths for self-balancing. Zip trees were designed by Robert Tarjan and Caleb Levy in 2018 and their paper is only material about zip trees at the moment. The aim of this thesis is to introduce zip trees in form ~~of material~~ comprehensible for students. The thesis ~~will~~ provide text describing zip trees in detail, ~~a reference implementation~~ and a visualization of a zip tree. The visualization will be an online tool that will allow students to perform basic operations such as add, update or delete a value from a tree and watch how the tree is changing.