

UNIS primary business activities are designing and building large oil refineries and chemicals processing plants, including the fire extinguishing technologies. In spite of the great accent of the fire safety, we are greatly concerned by cases of catastrophic industrial fires which are happening regularly all over the world. Some or most of these fires would not cause such damages if the firefighting started sooner, because if fire reaches a certain critical extent, it cannot be extinguished anymore.



In industrial plants with great risk of catastrophic fires, the current automatic fire extinguishing technologies like omni-directional sprinklers or inert gases are not effective. The only possible approach is to deliver as much coolant as possible in the very beginning of the fire and to deliver it precisely into the fire epicenter. On the other side, false alarms must be avoided, because the plant technologies must not be disabled or damaged by the coolant. Also, the coolant itself is often quite expensive and should not be wasted because of false alarms. Here comes the motivation for automatic water cannon extinguishers.

On Figure 3, our automatic water cannon prototype is shown. It is equipped with a camera-based fire detection system, which is able to distinguish standard industrial processes like welding or grinding from unintentional burning even in its early stage. The system is composed from the command/control center with our CMFD ARM-based image processing computer platform and the motorized water gun, which uses our BLDC motor drivers to aim the water gun by moving it in 2 axes.

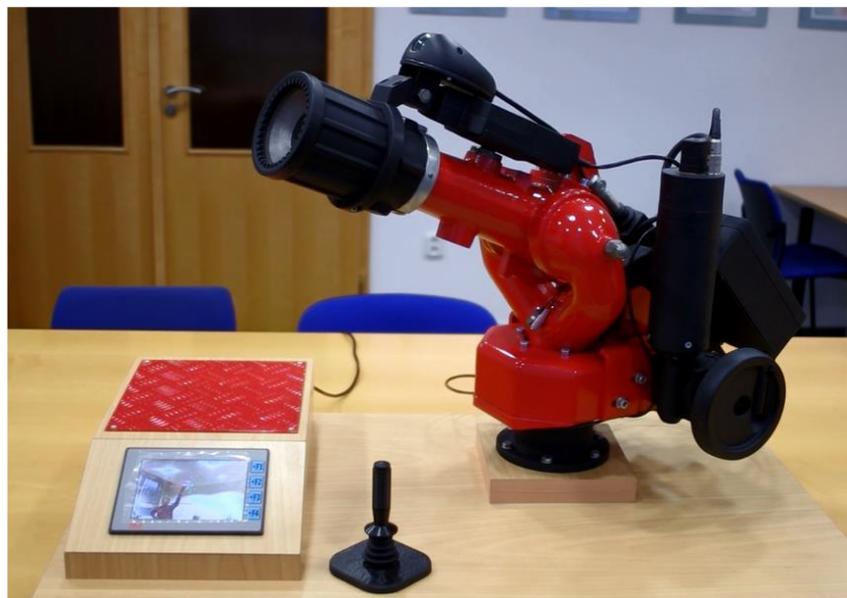


Figure 3: UNIS automatic water cannon prototype

## Our research

One of the most critical parts of our research is the correct detection of fire. For reducing false alarm ratio, we must correctly differentiate high-temperature technological processes (welding for example) from unintentional fire. Furthermore, the unintended has to be extinguished promptly, because the water gun extinguishers lose effectivity when the amount of heat energy produced by the fire is several times bigger than the cooling ability of the water source. We have achieved 98% positive detections with algorithms detecting fire from standard camera images combined with 1D signal from cheap pyroelectric sensors. We have also made a prototype of accurate aiming of the water cannon on the fire location based on images from multiple cameras and ballistics of the water streams.

## Applications

The automatic water cannons are usable in wide range of industrial settings - oil refineries, chemicals processing plants, metal, wood or plastic processing industry, electric power plants, mines, gas stations, storage warehouses, ammunition production or storage etc.

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