Water Removal from Protective Glass

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An important feature of video surveillance is that it is available at all times, even during bad weather. This is not the situation today. Today, many surveillance cameras suffer from rain drops on their protective glass, severely disturbing the image. A new technique for removing the water was developed using vibrations. With a successful result, this solution is something that we most certainly will see in the future.

Today's network outdoor surveillance cameras face problems when water drops stick to the protective glass in front of the camera lens, thus significantly disturbing the image. This problem mainly occurs during heavy rain weather or when the camera is being cleaned with a hose. Solving this problem would greatly improve the performance and versatility of outdoor surveillance cameras.

The way that the protective glass on cameras is cleaned today is by using wind shield wipers. This is a solution that works, but is not flawless. Since the protective glass is generally made of plastic, one of the main drawbacks with this solution is that it gets scratched by the wiper blade if sand or dirt gets stuck in between the blade and the glass.

During a 20 week period we have been working on finding a new solution for this problem. After considering and testing over 15 different concepts, a vibration concept was chosen for further development. By using image analysis algorithms and statistical software the vibration pattern could be optimized. The optimization gave us the best compromise between water removal performance, mechanical wear and power usage. Another aspect that was considered during the optimization was ensuring that the image quality was not affected negatively during the cleaning process.

After optimizing the vibration pattern and understanding how it affects the water drops, we were ready to start building the final prototype. All parts of the prototype were 3D-modeled before manufacturing began. This made it easy to make sure that all parts would fit together as intended. After making sure the parts would fit in a computer environment, they were 3D-printed in order to test them in real life. After multiple iterations, the prototype was ready for final manufacturing.

The next step of building the final prototype was designing the electronic control and choosing a motor. After many tests with different kinds of motors, a DC-motor was chosen. The motor was controlled using a simple controlling algorithm to obtain the desired vibration frequency.

Figure 1: *Image from surveillance camera during rain.*

The final prototype was successful in removing water from the protective glass of surveillance cameras, without using a significant amount of power. The outcome of this project will be an attractive feature for network surveillance cameras and we are hoping to see this solution implemented into future products.

1 This article was written as a result of a master thesis done for Axis Communications AB at Lund University.