Businescase Security Drone

A report on the succes and feasability of a security drone to reduce theft on building sites.

Group 1

Contents

Background

In the Netherlands only 100 million per year is spend in the construction industry on vandalism and criminality. Companies are bankrupted by the thefts occurring on building sites.

To prevent these thefts nowadays building coorporations install stationairy camera's. Those camera's themselves are very expensive and their application too is cost intensive. These camera's must be positioned multiple times, because of the changing building sites. Thereby are there mostly no walls or parts the camera's can be attached too. This results in very expensive camera units, which carry the camera's on poles, or solutions where stationary camera's must be repositioned multiple times.

The solution given here is a drone, which covers the whole area, has significantly less blind spots, and delivers solutions for a better recognition of the intruders and retracing the stolen goods.

Cost expectations

For this cost analysis a relatively simple model is used. The model consists of a square building suite. With some high unoverseeable objects. The model has a fence around the building site, to protect in the first case from intruders. The costs of the system depends of course on the duration of the system. For this analysis we use a time period of 1 month. The fee of a security guard is estimated

around 16 euro (night duty) and the fee for an installation engineer around 12 euro's per hour. (both systematically hired, no zzp) [12]

Current market situation 1

For an area of 50 by 90 meters, which uses 6 cameras including their installation is about €11.000,- euro's. The cameras are €750,- each. So a total of €4500,- is spent on the camera's themselves. The cables for the cameras are very expensive, and building this network is time and cost expensive. This system is after installation integrated in the building and will stay there permanently

What	Costs
Night vision camera's	€4.500,-
installation	€6.500,-
Contract with alarm receiving station	€32,92[3]
Total	€11032,92

Current market situation 2

An example of camera's installed in a medium sized building site[4]

8 Cameras/Outside Motion Detectors/Loud Tannoy/Unlimited Out Of Hrs Monitoring   £180 p/w

This system has only 4 camera's and those are only night time camera's. Thus in weekends, the building site is still not fully protected. There is no security guard reviewing this system and the camera's are quite simple, with a small reach. This way the building site is minimally secured. Therefore it is assumed, these simple systems are not a real competitor for our system.

What	Costs
Night vision camera's	€638,92
Contract with alarm receiving station	€32,92[5]
Total	€671,84

Current market situation 3

In the current situation, there are at least 5 stationary camera's needed. Night camera's which can see for at least 20 meters are around 750 euro. So only the camera's would be 750 euro's. The prejudice of these pricey camera's is they can see at day too. Those camera's are moved a lot and will be handled often. Therefore the prediction is that they will last for only a year. In one month 312,50 will be spend on these camera's.

---

[1] http://www.loonwijzer.nl/home/eigenbaaswijzer/tarief-check/uurtarieven-in-50-beroepen-zzpers-vergeleken-met-werknemers

[2] http://www.loonwijzer.nl/home/eigenbaaswijzer/tarief-check/uurtarieven-in-50-beroepen-zzpers-vergeleken-met-werknemers

[3] https://www.credexalarmsystems.eu/nl/smc-alarmcentrale-meldkamer-pac.html

[4] http://buildingsitecctv.com/

[5] https://www.credexalarmsystems.eu/nl/smc-alarmcentrale-meldkamer-pac.html

The installation costs are quite expensive too. Installation of a single camera is estimated for 0.5 hours. And connecting the total in the main system would take at least an hour too. Furthermore these camera's can't fly. And a construction site doesn't have many objects to attach the camera's too. So another 0.5 hour is required to make a construction of poles or something to attach the camera to. This would lead to a 6 hour installation procedure.

The construction site changes continually. The corner camera's will be stationed all day long in the same spot. But the middle camera, needs to be moved about every week, to obtain optimal situations. Therefore every week 1 hour installation should be required for a secure situation

Every night a security guard is needed to control the camera's. A security guard works form about 10 o'clock in the evening to 5 in the morning. The construction builders start early so this is why the security guard is dismissed this early. But it is still a night of 7 hours with a fee of 30 euro per hour. So this will cost 210 per night. 6300 per month.

What	Costs
Night vision camera's	€312,50
6 hour installation	€72,-
Security guard whole month	€3360,-
1 hour installation every week	€48,-
Total	€3542,50

Drone situation

The drone situation uses an infrared camera. These thermal cameras are quite costly. The estimation is about €2500,-. This would of course not be the cost reduction. But it replaces all 5 night vision camera's in the current building site. It has a normal camera too, with flash, so if an intruder must be captured, it will be able to do so. These cameras are made for outdoors and will only be handled by the drone. Because of their careful handling the expectation will be that they can last for at least 2 years of employment. Therefore they will cost 104,16 euro's a month. A battery replacing system is included in the drone, because a drones battery only lasts for about 45 minutes. Such batteries take about 1,5 hour to get fully loaded again, so the drone requires 3 batteries and the battery changing system. The total of the canging/charging system and batteries costs about 430 (3 times 105 for the battery and 40 for the docking system (…)75 for the system which plugs the batteries in and out, which has to be made). The batteries will last for about a year so 35,83must be payed every month

The installation costs would be way cheaper. The docking station must be placed somewhere in the construction site and the main points to navigate to must be installed. This would only take 1 hour and no intermediate reinstallation in the whole period.

Furthermore the security guard can overview 4 or 5 construction building sites in the same time. This would reduce the security costs to 1/5 of its original costs

The drone is an extra cost in this model. But the drone lasts longer than one month and can be reused. If the price of the drone is estimated about 4000 euro's, and the drone is estimated to last for 3 years. In one month about 110 euro must be reserved for the drone's costs.

What	Costs
Thermal camera	€104,16
6 hour installation	€12,-
Security guard whole month	€672,-
Drone	€110,-
batteries	€35,83
Total	€933,99

 Besides the material and fee costs, less intruders will be able to escape the security. Therefore there will also be a cost reduction in these things.

This analysis presents a way cheaper and definitely more valuable detection versus the current situation.

Focus

The problem which is focused on is theft on building suites when those are supposed to be abandoned. This means at night time or weekends / vacations. These building suites are surrounded by fences, but still intruders try to break in quite often. The value of the goods located at those building sites are surprisingly high, especially the specialized tools. This is highly disadvantageous for the building companies. Therefore they try to protect their goods with the stationairy camera's named before. But their reach and coverage is not enough to stop all intruders. Still there are valuable goods stolen because of mazes in the security of the building sites. Another problem is vandalism like graffiti on those building sites. Cleaning of this craffity is expensive, especially when the constructions are this new.

The problem which must be solved is to cover the continuously changing building sites, to prevent theft or vandalism by intruders.

Some assumptions have been made about the situations and the intruders.

- The intruders have breached the normal fences surrounding the building site, and will therefore always enter through these breaches in the fences.
- The intruders are able to hide underneath or behind obstacles.

Testresults

The drone introduced in this business case is tested in a simulation to show and prove it's effectiveness.

Here will be the testresults of the drone in the simulation

Impact

As can be seen less intruders will be able to leave the building site unnoticed and thereby they will be caught on tape a lot more often. There will be more for the police to investigate and they will catch those intruders also more often…

Stakeholders

By using this system a security company will reduce it's costs and improve their results. This is why it is assumed the main stakeholders are security company's

There are a lot of users profiting from this system. This system will, like we already mentioned, be used as addition to the security of a site. The primary user of this system will be the security manager, which is located in a control room and responding to all alarms or messages the drones will send. This control room could either be in the building itself, like musea or military buildings which need extreme surveillance, and where it is essentially to react within seconds on site. Or this control room could be in a strategic place, and be able to manage multiple buildings or sites at the same time. Either way, the security is the primary user of this system, because he interacts directly with it, and is the person responding to it. Those primary users will think the system is useful because it gives warnings at detected movements or displacements. The system will miss less small changes than a person could, and therefore help the security manager to make less mistakes, or overlooked clues.

The secondary users are the security companies. Because their security managers make less mistakes, they function better and will provide better surveillance. Furthermore the system will be less expensive. Therefore, less manpower is needed this way and there will be less installation costs, because you don't have to install and implement more complicated systems like hidden camera's.

Another secondary user is the company or owner which hires the services of a security company using those drones. They will profit greatly by better surveillance, because of the previous named reasons. Even if the burglars succeed to break in, the drone will try to take pictures of the suspects, and to lock them in. By these pictures the persons will be tracked down sooner and this will be an amiable aspect of the drone for everyone.

A tertiary user will be the society. By helping to induce thefts and insurance costs.

Other tertiary users will be the insurance companies. Less break ins and especially less unsolved break-ins will lead to a more optimal situation for the insurance companies. Furthermore any footage of the drones can clear situations which involve fraud by employees or anything. These will all be caught on tape when the drone is working.

Another tertiary user will be the police and or the state. Those will profit especially from the pictures the drone takes from burglars. Those will be very helpful for the police in catching the guys and completing the investigation.

The intruders are tertiairy users too. These won't interact a lot with the system, but they will notice the drone. Later on there will be some considerations about the detectability of the drone.

Technical aspects

To establish a working drone several steps must be done.

First of al a dual camera with a heat sensor and a normal camera's is needed. . Thermal cameras alone do not seem to be very usefull for identification. This means a second camera is required for identification. But there is also a third option: A two in one camera. This is a camera that has both a thermal camera and a regular camera. A camera that would be very useful for this applicatoin is the Mini Dual-Sensor Camera Module for UAV/UGV Integration. This dual camera has a FLIR TAU 2

320x240 pixel or 640x480 pixel thermal camera and a SONY 10X Optical Zoom 530TV Line Color Camera (w/12X Digital Zoom) regular camera and it is designed for drones.[6]

Furthermore a drone is needed, which has the capability of switching its batteries and has a distance sensor for it's navigation. Furthermore the drone needs GPS to know its location. The battery of a drone only lasts for a maximum of 45 minutes. Therefore it is useful to use a drone which can switch batteries. A system like explained in appendix A must be designed to establish this. This also means the drone must be either custom made or has the possibility of being adapted. Therefore the costs of the drone are quite high in the cost analysis.

By combining these aspects and the same software the simulation uses, the drone can be finished.

Needed expertises

As can be seen some expertise is needed to establish the drone

To start there needs to be an expert in drone navigation to navigate the drone. It is expected that the drone can use a lot of the same software as the simulation uses. But still the drone needs to be assembled, and it has to be made ready to fly. Therefore we need a drone specialist or drone mechanic.

The third expertise we need is a security guard to react at the drones signals. The rest of the drone is already created in the simulation.

Considerations

Some concerns have to be made when implementing this system

First of all the visibility of the drone. There are multiple pros and cons in making the drone easy detectable for everyone.

First of all by making the drone visible, it may have an dissuasive effect. If it is thought the place is well protected, intruders or vandalists will be less inclined in entering the place. Especially those who commit minor violations like graffiti will watch out for those kinds of places. Especially because the drone with camera will be accompanied by clear informative signs on the fences which inform passer-by's there is camera observation and security drones.

But in contrary the clearly visible drone will be easier to spot and therefore a person may be able to hide in time. Especially when the drone is also clearly audible, they can hide before being in their visual field. By that the drone is also easier to take down, because localization is easier. But if the drone is taken down, there will be automatically send to the guard. So in this situation the intruder will still be caught hopefully.

Another consideration is the interaction with the intruder

---

[6] OEM cameras, Product: http://www.oemcameras.com/mini-dual-sensor-thermal-visible-camera-module.htm

The drone can follow the suspect as silent as possible, so they will take their time to get everything and this buys the police some time to arrive. But the other possibility is to turn on a loud noise or lights, which scares off the intruder. The best possibility will be the combination. If the intruder is already with the valuable goods, the drone should stay silent for the police to arrive. But if the intruder hasn't reached the valuable goods, and the loud sound goes off, this will probably scare off the intruder. Which hopefully leaves without taking anything. This won't get the intruder caught, but it will prevent from theft.