EXECUTIVE SUMMARY

The implementation of a RoboCop in today’s society is analyzed from multiple standpoints. The purpose of this report is to determine whether or not this implementation has any realistic potential for today’s society. Both technology researchers and law enforcement entities will use this report to determine a feasible approach to law enforcement.

The implementation is examined from a standpoint of technology, criminal activity, and morality. Technology is examined on a worldwide scale, but morality is examined from a North American standpoint. The implementation would be virtually the same all across the world, but this report focuses on the North American market for no reason other than the inherent need for a supercop on our streets.

While a percentage of the population may be skeptical of having a walking, talking, robot machine, technology now supports the act of controlling an exoskeleton with your body. Since the humanity of the officer is intact, the act is considered moral. As a result of this discovery, it is determined that RoboCop is given our full support.

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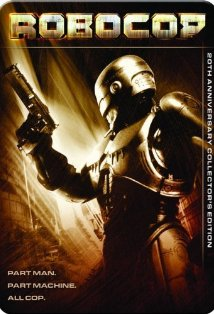
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1 Introduction

1.1 Purpose

This report is meant to determine how feasible it would be to have a real Robo-Cop in our society. This report is also directed to those who have roles in either law enforcement, or in biotechnological fields of those pertaining to the development of cyborg related items. This report should give an insight as to the challenges that may need to be overcome, as well as a guideline as to what paths of research should and should not be taken. A Robo-Cop is both a good, and feasible idea for the immediate future for the reasons that we have seen a genuine need for a Robo-Cop, and that the technology needed to create one is here if not very nearly here.

1.2 Background

Throughout time, literature and media have inspired some amazing figures in both science fiction and fantasy. From the ferocious dragon to the all-knowing Artificial Intelligence, we have seen the birth of many amazing concepts. In the 1980’s, an existing concept was redefined in a way that had never been seen before. This idea was Robo-Cop. The idea behind Robo-Cop is a terminally wounded police officer that returns to the force a hardened super cop. A cyborg. With all the plights he faces, he still provides an effective method of fighting crime, and would be a valuable asset to society.

ROBOCOP from www.imdb.com

1.3 Scope

All specifications for the possibly implemented Robo-Cop are outlined in chapter 2, and are followed by the potential issues surrounding the development of a Robo-Cop in chapter 3. These issues surround three key concepts: The first concept, which is under chapter 3.1, is technology, and whether or not it has developed enough as to allow the implementation of a Robo-Cop. Chapter 3.2 shows the second concept which gauges the public’s need for protection from a Robo-Cop. Finally, Chapter 3.3 will address the public’s response to creating a cyborg, and whether or not it would allow such a creature to exist. Chapter 4 will conclude the report, restating some key points and stating a firm position. Annex B shows sources used within the text, and Annex R shows references to useful topics for further reading.

# 2 Robo-Cop Specifications

2.1 Technical Description

2.1.1 Powered Exoskeletons

The powered exoskeleton is a suit designed to give the user protection, extra strength, and assistive abilities for the disabled. This suit will allow police officers, entitled Robo-Cops, to enter dangerous situations by themselves; where as a normal officer would require a team for back up. It also allows disabled officers use of their legs and arms again, and allows them to get back in the field.

[DIAGRAM OF ROBO-COP]

The exoskeleton can be broken down into 2 major sections: the Armor and the underlying powered exoskeleton.

2.1.1.1 The Armor

[SKETCH OF AN ARMOR PIECE, EXPLODED VIEW]

The armor’s main purpose is to protect the Robo-cop. The armor is designed specifically for 1 individual Robo-Cop.

* The armor is made of a titanium alloy; it is roughly 2cm thick to offer adequate protection of the individual adequately.
* The armor weighs 50 pounds; the Robo-Cop is unaware of the weight because the powered skeleton carries most of the weight.
* The armor sits 5cm off the Robo-Cop’s body allowing for more flexibility inside the armor.
* The armor is made of several pieces; these pieces are the chest piece, the headpiece, the shoulder pieces, the arm pieces, the hand pieces, and the leg pieces. Each piece is split into 2 independent parts, held together by large metal bolts.
* The back piece is designed to protect the computers as well as over proper support for the Robo-Cop’s back.

2.1.1.2 The Powered Exoskeleton

The main purpose of the exoskeleton is to carry the weight of the armor, computer and its battery. Its secondary purpose is to increase the Robo-Cops strength significantly.

[SKETCH OF SKELETON]

* The battery can last up to 3 days.
* The exoskeleton is rather flexible and made of plastic.
* The exoskeleton can carry a weight of 150 pounds without the Robo-Cop feeling it. The average Robo-Cop can carry 350 pounds at the maximum with the exoskeleton.
* It can be modified to provide extra power to legs and arms for disabled officers, this effectively reduces the total carrying weight, but allows disabled officers to walk and function normally.
* The exoskeleton follows the legs and arms with joints where labeled [this is coming in the sketch].
* The exoskeleton uses its onboard computer with the help of the powered joints to help with natural movements. The onboard computer automatically detects motions and adjusts to them as required. [Strength is controlled by the CPU-Brain, so I’m only covering that part in the next section].

This powered exoskeleton will give Robo-Cops extra protection and strength giving them a decisive advantage over normal cops. This will allow Robo-Cops to be a significant force in the justice system, as well as give disabled cops the ability to return to cleaning the streets of all unlawful behaviors.

2.2 Process Description

2.2.1 Assembly of Robocop

**2.2.1.1 Choosing a candidate**

* Willing participant
* Good track record (With great power comes great responsibility.
* Physically Disabled is preferred, but not required, this allows disabled officers to return to the field if needed

**2.2.1.2 Training the candidate**

* Rigorous training with the BCI
* Training with the suit, very much needed if the cop is disabled
* Run through intensive training simulations

**2.2.1.3 Preparing the candidate**

* Last Opt-Out Point
* Installing all the necessary components of the BCI and exoskeleton together
* Permanently attaching the exoskeleton to the individual
* Attaching the armor to the exoskeleton

**2.2.1.4 Activating the candidate**

* Activate and awaken the Robocop
* Run through necessary tests of software and hardware
  + Test MS-DOS systems
  + Ask Robocop to follow simple instructions
  + Asked to do complex movements and tasks
* Run through intensive same training simulations to determine how well the systems and the Robocop have adapted

# 3 Potential Issues

3.1 Advances in Biotechnology

Biotechnology over the past few years has made incredible leaps and bounds since the original Robo-Cop. In the 80s, the concept of a powered exoskeleton was considered mere science fiction, no more than 30 years later. With the advent of technology such as Hybrid Assistive Limbs and computers able to play pong simply with a helmet, the concept is almost within the grasps of the general public.

3.1.1 Powered Exoskeletons

Powered exoskeletons are designed to provide strength, protection and assistance. With the need for protection in dangerous combat environments, as well as long treks in harsh conditions, the American army has had a need for a suit that would provide the user with extra power while carrying extremely heavy gear. Companies have tried to make exoskeletons work well, General Electric, in the 1960s, attempted to design the first powered exoskeleton, it was a failure mainly due to the fact that the unit could not control its own movements. In the past 50 years, huge improvements have been made. The most notable is Cyberdyne Inc. Hybrid Assistive Limbs (HAL).



The Hal Suit estimated $4,200. Image from http://www.phyxr.com/pix/hal\_suit.jpg

The HAL can carry up to 150 kilograms of weight without the user noticing very much of the weight. It uses Electroencephalography (EEG) technology to determine how an individual may decide to move and react appropriately. The suit currently has a battery life of 2 hours, with a larger battery in the realm of possibility. The HAL has also been designed to support the weight of those who can not support their own weight. Recently, Cyberdyne began renting out the suits for $4,200.

3.1.2 Brain-computer Interfaces

Brain-computer interface (BCI) research deals attempts to improve functionality and repair the functions of the brain through the use of computers. The filed is split up into 3 major research areas, invasive, partially-invasive, and non-invasive area. Each research area has advantages and disadvantages. The invasive BCI has the advantage of being the most research, but it is rather risky because it can kill the cop under the wrong circumstances. Although partially-invasive BCI research is a valid research method, it has yet to produce reliable results and as such will be ignored.

3.1.2.1 Invasive BCIs

Invasive BCI is mostly focused on returning sight or motor functionality to the individual. Considering how much of the brain has been mapped out, direct access would offer the greatest amount of speed across the computer and the brain.

The process of installing this interface would involve cutting open the skull of an individual and installing nodes into to brain. Nodes would mostly be installed in the frontal cortex of the brain. The frontal cortex contains the motor system allowing computer direct access to the brain and its motor function. The premotor cortex stores information on patterns, for example walking, this would allow the exoskeleton to distribute power properly. The motor cortex controls more deliberate actions allowing the computer to determine whether the Robo-Cop needs extra power in certain areas of the suit.

With the invasive nature of this research area, there are a few major problems with this type of BCI. The biggest problem with this interface type is due to the direct connection to the brain, for example, if the computer was to have a power surge, it would also send the surge to the components in the brain causing permanent damage to the brain. Other risks involve pulling on these wires causing damage to the frontal cortex, contaminants getting inside and having full access to the grey matter. Ignoring the risks, there is also the risk of signal degradation, as the brain starts to recover from nodes on the brain, it will create scar tissue that will eventually lead to signal loss, this would mean that as the Robo-Cop gets more use and it would be less effective as time goes on.

Unfortunately due to the risk involved and the eventual signal loss, even when considering the initial speed advantages, it is unlikely that the invasive BCIs are to be used.

3.1.2.2 Non-invasive BCIs

Non-Invasive BCI tries to accomplish what invasive BCIs do without the need to penetrate the skull. This offers less risk to the Robo-Cop, but because the skull has not been penetrated leads to significantly higher amount of noise. This type of interface has allowed people to play pong as well as type messages.

The most prominent form of non-invasive BCIs is Electroencephalography (EEG); EEG has shown that with training a user is able to perform simple tasks of typing out messages. EEG analyses the electrical activity of the brain through diodes on the surface of the skin, since the skull is between the diodes and the electrical activity appears weaker, noisier leading to less accurate readings.

With the appropriate training and proper kinetic anticipation algorithms, the non-invasive BCIs are a very good system to use with Robo-Cops, and they do not require surgery for the technology to be possible.

A Brain-Computer Interface. From http://lifeboat. com/images/brain-computer.interface.jpg

With the available technology, nearly within grasps, it is possible to think that fully functional Robo-Cop suits will be available within the next 10 years. The technology for the exoskeleton suit is already available to the public, the only missing part is a fully functional BCI device, and clearly we are going to be able to create a reliable interface in the near future.

3.2 Advances in Criminal Activity

The need for a Robo-Cop is real and ever so evident with today’s criminal mind. Criminals are creating new and advance ways to acquire monetary gain than ever before. Thus the need for a high tech solution is created. A police officer made of man and machine would provide the solution. From the beginning of time pirates has been a large part in the suffering of the everyday citizen. The evolution of pirates is a good example of the evolution of the criminal.

3.2.1 Evolution of the Pirate

3.2.1.1 Cannons and Swashbucklers

Think of the word pirate, you think of tall wooden ships, with huge masts and black flags with skull and cross bones fluttering in the wind. Or maybe these words come to mind; swords, pistols, cannonballs and swashbucklers. Whichever list that triggers a memory, an agreement can be made that they both paint a nasty picture. Pirates are known to be raiders on the high seas; going from harbour to harbour raping and pillaging and taking anything they want. Pirates are also known to be thieves and rogues, stopping merchant ships and stealing whatever riches the merchant ship carries. Traveling by sea was only for the brave. Over the decades, the Pirates have changed with the times.

3.2.1.2 The Modern Pirate

No longer wielding swords and cannon, these advanced pirates are “heavily armed with rocket-propelled grenades and AK-47s.”[B5] When you think about modern pirates, you might think of the Somalian Pirates and their recent mischievous activities. For example: the taking of hostages, demanding ransoms for hostages and stealing from merchant ships. In an article from BBC news it states that, “there have been 147 incidents in the waters off the Somali coast and in the Gulf of Aden, compared with 63 for the same period last year. A total of 533 crew members have been taken hostage. [B5] Pirate activity has increased over the years. A recent example of this from an article “Hijacking of a Saudi supertanker points to widening ambitions and capabilities “ it reads; “In their most audacious attack yet, they recently hijacked the MV Sirius Star, one of the world's largest oil tankers, laden with more than 2 million barrels of crude oil. The assault took place nearly 450 miles off the coast of the Horn of Africa.” [B6] In this day in age, the need for a Robo-Cop is clear. Pirates are developing new ingenious ways to commit their crimes. “The pirates move extremely quickly and often at night and so it is often too late before the crew has realised what has happened.” These are the same techniques as Ninjas. Robo-Cop would be able to track and stop these ninja pirates. Ninja Pirates with high technology capabilities.

3.2.1.3 ARGGGGH!!! I NEED TO CHECK ME EMAILS!!!!

Pirates have taken to the high seas of the internets, raping and pillaging distribution and production companies of profits. Pirates accomplish this by using Peer-2-Peer networks to share movies, games and music acquired by any means and redistributing copies to anyone that wants one. They also have the Facebook.

The Pirate Bay logo

3.2.2 Cases

Now, to take a closer look at the cases themselves, they will prove the very need for a Robo-Cop. The following cases portray violent and technological ways modern criminals use to accomplish their goals. These very reasons Robo-Cop would be designed to counter.

3.2.2.1 Office Space

In the movie Office Space, the character Michael Bolton devises a plan to steal money from the company he is being fired from. “Michael explains that the virus will take the fractions of a penny that remain on every bank transaction and deposit them into an account. The theft will be so gradual that it will take years before it's even noticed. The three friends agree that it's a foolproof scam, and decide to put it in motion the following day before Samir and Michael are let go for good. (imbd) Robo-Cop would have a direct uplink to the internet; he would be able to monitor all traffic fixing any errors and hacks with the tiniest of effort.

3.2.2.2 Mission Impossible

Here is a burglar, which has been nicknamed the Mission Impossible burglar. The article reads as follows. “The ‘Mission Impossible’ burglar who used a combination of high-tech equipment and ropes to make daring rooftop entries into electronics stores throughout Southern California has been arrested. The burglars used grappling hooks to climb to the building's roof, cut a hole through it and climbed inside by using a rope ladder.”(Man Held)

3.2.3 Wanted

3.2.3.1 Queen of Tech. Comm.

Allegedly the suspect was seen on Woodroffe Avenue harassing passerby about the importance of Process Descriptions and Technical Descriptions. One student witnessed the suspect grabbing his class mate by the shoulders and shaking him silly, yelling at the top of their lungs, “YOU WON’T GET ANYWHERE IN LIFE WITHOUT ILLUSTRATIONS IN YOUR TECHNICAL Description!!” The suspect is described as 5’8? Has a small build with fiery red hair. Suspect is considered armed and dangerous. Do not approach her.

3.3 Ethical and Moral Issues Surrounding Cyborgs

Up until now we have discussed both the possible technological limitations of creating a Robo-Cop, as well as the general need for one in our society. Before we can make a decision, however, we must take into account how the public will react to a Robo-Cop’s development, and whether or not our society can accept such a change in law enforcement.

3.3.1 On Morality

When considering the protection of its citizens, a nation has to tread very carefully. Morality should not be taken lightly, considering our governing body is built on a foundation of what we consider to be a human moral code.

3.3.1.1 What Does it Mean to be Moral?

Morality is a term that is thrown around often. In the broadest sense, to be moral is to prevent both physical and emotional suffering, whether directly or indirectly, to another being. Morality is something we as humans have developed over time, and likely did so in a time before we were truly human [B11]. Regardless of how we acquired this set of morals, it remains a fact that our society is built upon a moral ideology, and this ideology is how our society governs its people. For over a millennium, people have not only lived by a set of morals, but have also sought to condemn those who would dare to break them. The problem with this method, then, lies in who we use to enforce our set of morals, and whether or not they can be trusted themselves not to abuse the power they are given. In today’s society, our governing body appoints people to uphold the morals we hold dear, and we all hope that those people appointed truly have our best interest at heart. How can we be sure then, that a cyborg can enforce the morals of an entire society, when we cannot be sure it observes morality itself?

3.3.1.2 Can a Machine Observe Morality?

A machine is an object that uses energy to perform an action. By this definition, we as humans are all machines, running around using energy and performing actions. Morality, however, is much more complex in nature, making the question of observing morality much harder to answer. Considering we, as humans, are in fact machines ourselves, it makes it easy to suggest that a machine itself can observe morality. Now, when considering the possibility of creating a Robo-Cop, it is imperative that the Robo-Cop retains but one key element: free will. Free will is a key aspect of morality, and is crucial to the human condition. If the ability to make your own choices disappears, then any humanity you may have possessed would now be gone. To remove free will is the equivalent of murder, and society would not support such actions. A moral Robo-Cop then, is indeed a possibility, but in its creation it must remain human, and must be able to make choices.

3.3.1.3 Conflicts Arising Between Machines and Their Judgment

“…biological humanity is not always necessary for moral worth, and it need not be a prerequisite for moral responsibility.”[B11] This idea, quoted from Russell Blackford, shows that an entity that is not technically alive, at least from a biological standpoint, may be capable of expressing moral obligations. The ultimate question to pose, however, would be as to what choices our Robo-Cop will have to make, and whether or not it will be able to make the right one. Can society trust a being that has the ability to do serious harm? The answer to this question should be the same as when talking about a human police officer. All police officers need to express a degree of judgment in the line of duty, which means a Robo-Cop should be subjected to uphold the same standards.

In terms of morality, and whether or not a Robo-Cop would truly be able to make a moral decision that could result in a death, the answer rests in what technology will be available in the near future. Looking ahead, however, it seems that the implementation of a cyborg officer would offer an improvement over the moral ambiguity that humans face in today’s law enforcement.

3.3.2 A Blurring Line Between Man and Machine

In order to determine whether or not a Robo-Cop can exist, we need to look at what it means to be human, what it means to be a robot, and what happens when the two are combined.

3.3.2.1 The Bald Man Analogy

Consider a man with a full head of hair. You know this man has a full head of hair, because it is thick and easy to see, as it covers all of his head. Now consider a bald man who has not one single hair on his head. You know this man is bald because he lacks any hair whatsoever, and it is plain to see. The real question, however, is what happens when this man has but a single strand of hair on his head? Is he bald, or is he not?[B9] This analogy is directly synonymous when we look at human beings who obtain properties of a machine, or even when a machine gains the ability to process thought and judgment. When do we consider the human being a machine, or the machine a human being, and what qualities of their original being do they hold on to?

3.3.2.2 Where is This Blurring Line?

As seen in the analogy of the bald man, it is difficult to establish a line between people and machines when they acquire traits of the other. In the case of a Robo-Cop, it would seem that he would be considered to be half human, and half machine. [B9]This is not generally correct, however, because a Robo-Cop does not necessarily have to be completely merged with a piece of technology, but could merely be enhanced. The idea in terms of avoiding public criticism would be that Robo-Cop would have to retain its human integrity. The line between human and machine can be stretched in such a way as to maintain a human integrity, and it involves using artificial body parts.

Cyborg from http://www.hyperborea.org/flash/cyborg.html

3.3.2.3 Artificial Body Parts

Using artificial body parts that have enhanced abilities, such as flamethrowers and antigravity beams, would be the likely outcome. Technology that could be controlled and managed by the already existing human brain would be no worse than putting a gun in a man’s hand. People use artificial body parts readily in today’s society. Hearing aids, prosthetic legs and x-ray glasses are all devices that are used to improve a person’s natural ability. In respect to the morality of physically altering the human body to create a Robo-Cop, the public should not be against the idea, considering the human integrity of the person being changed is not jeopardized.

3.3.3 Death and Murder

Death and murder are the worst crimes in society, and are met with great punishment and ridicule. Whether the death of a civilian, or the death of a police officer, this is an area where extra caution would have to be taken.

3.3.3.1 What Does it Mean to be Dead?

This is not necessarily a philosophical question, but rather one that addresses the problems involving the merging of human and machine, and whether life can still exist in such a configuration. When someone is dead, they are simply lifeless. That is, they perform no function at all. They are turned off, never again to be a contributing part of this world. What about someone who is in a vegetative state, though? Someone who can still participate no emotion or action in the world, and yet is still considered alive. If this semi-lifeless person can still be considered alive, surely a cyborg, who will exhibit lifelike behaviour, will be considered alive. Since a cyborg should be considered alive, then what happens when it makes a mistake? Should it be made to suffer the consequences as any human should?

3.3.3.2 Can a Machine Commit Murder?

If a Robo-Cop were to kill someone unintentionally, or even in cold blood [B10], would it be subject to the same judgment as the rest of humanity? Would we try a toaster for assault when it burns someone’s hand? Both of these questions are relative, depending on how much control the cyborg has over the actions it takes. No society would welcome a being that could kill so readily, and yet cannot be tried or convicted for its actions. The only way a cyborg would be allowed to take part in law enforcement would be if it were capable of making moral choices, and would suffer the consequences for making wrong ones.

# 4 Conclusion

Starting with the fictitious idea of a half man half robot police officer in the 1980`s, it was unclear if such a idea could be created. With the previous stated specific advances in Biotechnology, it is clear that the citizens of earth have the intelligence and technology to create such a being to help police today`s criminals. A question of morality arises with this idea. With extensive research the citizens of the earth are more than willing to accept the idea of given a wounded police officer a second chance with new arms and legs or giving an individual to once again gain the ability to use certain parts of their body where they could not before. With regards to the current state of criminal activity, the growing ingenious criminal mind develop ways to terrorize the citizens of the earth, the need for a high tech solution is ever so evident. The evolution of pirates is a real depiction of how quickly the criminal organization and life is growing. This is the most appropriate time to develop a real Robo-cop. The technology is available; the evil ingenious criminals are out terrorizing the people of earth and the moralities of its citizens are united for the restoration of life.

Annex B

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**Annex R**

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