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Not a Prediction of the Future: Believable Sci-fi Character Design Based on Present Day Technology

Kun Dong
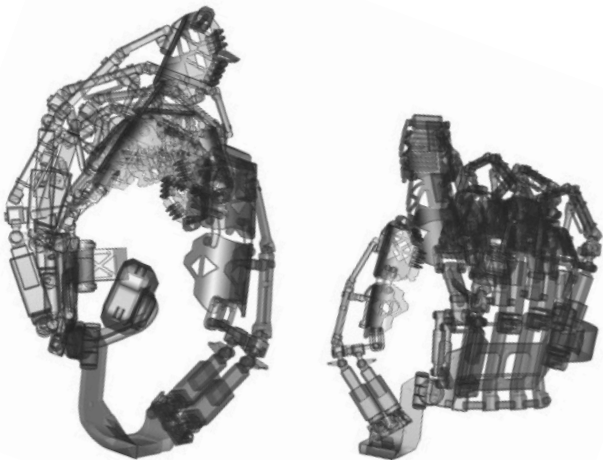kxd2395@rit.edu

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Not a Prediction of the Future:

Believable Sci-fi Character Design

Based on Present Day Technology

Kun Dong

A Thesis submitted in partial fulfillment of the requirements
for the degree of: Master of Fine Arts in Visual Communication Design
School of Design | College of Imaging Arts and Sciences
Rochester Institute of Technology

December 2016

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Abstract

In recent years, many character designs made for movies and video games have been carried out using complex computer-based processes. User-friendly software has made it easier to produce high computation artwork and multiple texture maps.

With higher graphic performance provided by rapidly improving hardware, the continuing demand for innovation poses new requirements for the entertainment industry.

Science fiction (sci-fi) in video games and movies has limitless capabilities, and can be created to achieve a wide variety of visual goals.

One important argument presented in this thesis is that science fiction stories, unlike the related genre of fantasy, have historically intended to have at least a faint grounding in science-based fact or theory at the time the story was created. However, this connection has become tenuous, or even non-existent, in much of today's science fiction.

The author of this paper studied character design, and analyzed examples from the fields of robotics and prosthetics, as well as innovations in military technology, followed by experiments with different approaches to construct better detail and character elements in 3D.

This research aims to explore the combining of the need for innovation in character design, with the possibilities derived from 3D art and other substantive technologies.

Introduction

Story Background

The background is set in the near future, around 70 years from the present.
A 'near future' setup would, the author believed, help the design through providing more technological reference.

The first character ("The Robot") is an AI entity with a robotic body, which has developed self-awareness. This robot lives in a hideout in the city ruins of the imagined future world, and collects scraps, which he trades for living side-by-side with people from the slums.

With the help of people who support AI rights, this character has stored a 'back-up' of his mind in an abandoned satellite, and for safety reasons occasionally connects his network to this satellite. When he 'syncs' himself with his back-up, the effect is, he works like a huge Marionette. This means, he can live with or without this robotic body.

He travels from place to place, and fights for his right to live. But the human race has felt the pressure: people want better control over AI and their service robots. A conflict has begun between AI and human beings, making this robot a refugee in a human world.

The second character ("The Human"), is a special agent, who is an older male cyborg. His organization (PERB: the Prevention of Existential Risk Bureau) stands directly opposed to AI refugees. His job is hunting down stray AI entities, and sending them back to quarantine and analysis – the place where their 'freewill' came from.

In 2086, most countries are using robots in the battlefield. However, because PERB is fighting against AI and battle robots and could get hacked through the network, they still use well-trained humans for their dangerous missions. To better match the strength of the robots, they largely rely on cybernetic body parts and other hi-tech equipment, such as exoskeletons and long-range sensors.

In brief, this character is a human wearing a great deal of robotic parts and protections. His helmet offers maximum protection, his exoskeleton gives him mobility and strength, and with his sensors and brain-computer interface, he has super-human senses. Having an unmodified brain is a must for PERB agents, as it means that they cannot be hacked through public networks. It also makes them immune to electromagnetic interference.

The job of PERB is particularly dangerous, and this man was once badly injured, and wears a prosthetic left arm.

Background Problem

For this project, the story was built into the props, costumes, and all other details. Character Design is one of the most important elements in any story, and of most of the products of the creative industry as a whole. Regardless of the medium through which it is conveyed – be it film, television, video games, animations, books, or comics – character development has to fulfill high standards in order to convince the audience. Certain principles of character design can also be applied to convergent media utilization (Elkington 2009, 233- 235), and cater to the demand of the market for products which are compatible with a broad range of media. In this regard, character creation can lead to successful entertainment franchises, which match the preferences of different types of audience.

The author experimented a great deal, in order to give depth to the sci-fi concept in the design process. It needed to be both detailed and realistic. The background which was created for the characters was also based on substantive materials, and served the overall design.

The background narrative to the character designs address the following design questions:

- How can the characters' appearance be generated through use of technology?

- To what degree can existing technology be fused with or replace a human character's body, whilst still keeping the character 'human'?

- When creating believable characters, could a robot or AI present an appealing character?

- How can one create visually realistic depictions through 3D?

Generally the design decisions were made with reference to the future of cybernetics. Cybernetics is a transdisciplinary approach for exploring regulatory systems – their structures, constraints, and possibilities. My aim was to experiment with character design to illustrate how technology can be used in human prosthetics and other future augmentations.

The methods involved in the design process included: Concept Art, Cloth Simulation, Digital Sculpturing, High-Poly Modeling, Real-time Rendering, and Image Compositing.

Keywords: 3D Modeling, Concept Art, Character Design, Digital Sculpturing, Hard Science Fiction

Review of the literature

The continuing need for innovation in character design and realistic sci-fi (hard sci-fi) encouraged the author to research the creation of many new scientific innovations. Based on the experiment results, the author designed and implemented two highly detailed 3D character models.

The research for this thesis began with new or existing technologies, with the aim of making the characters more realistic, visually functional, aesthetic, and rigorous. In the process, the author avoided uncertain or abstract technological aspects, such as: specific technical parameters, Moore`s law, and human engineering (Parmentola, 2006). When difficulty was encountered accessing certain materials, the issue was either 'blurred' or theoretically possible technologies or predictions drawn upon, using sci-fi as a reference. In comparison with the projects taken as references, this research explored only the surface, and took whatever visually interesting aspect presented itself, with a focus on mechanisms and motor activity in robotics (for instance, joint configurations). In brief, the 'look' was the focus of concern in this research.
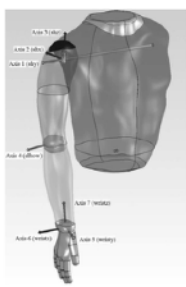

Upper-Limb Powered Exoskeleton Design   EXO–UL3

Bionics Lab., University of California, Santa Cruz
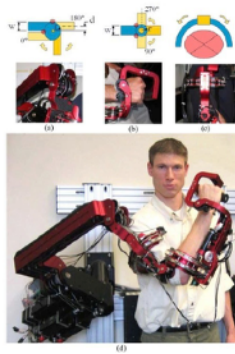
Joel C. Perry, Jacob Rosen, *Member, IEEE*, and Stephen Burns

Figure 01.1: Reference: Exoskeleton Prototype 3
(EXO-UL3), Upper-Limb Powered Exoskeleton Design,
Bionics Lab, University of California

EXO–UL3 is an upper-limb exoskeleton, made by Bionics Lab., University of California, Santa Cruz. It is still a prototype. EXO-UL3 was used as a reference for joint design. An exoskeleton system usually has more complicated joints than those of human limbs, and this system is assigned to the human joints for flexion-extension, and moves in concert with the bones of human limbs. My design has nine single-axis revolution joints. The positive rotation around each joint produces the following motions: flexion-

extension, 90 and 180 degree rotation, radial-ulnar deviation, abduction-adduction, internal and external rotation, and pronation-supination.
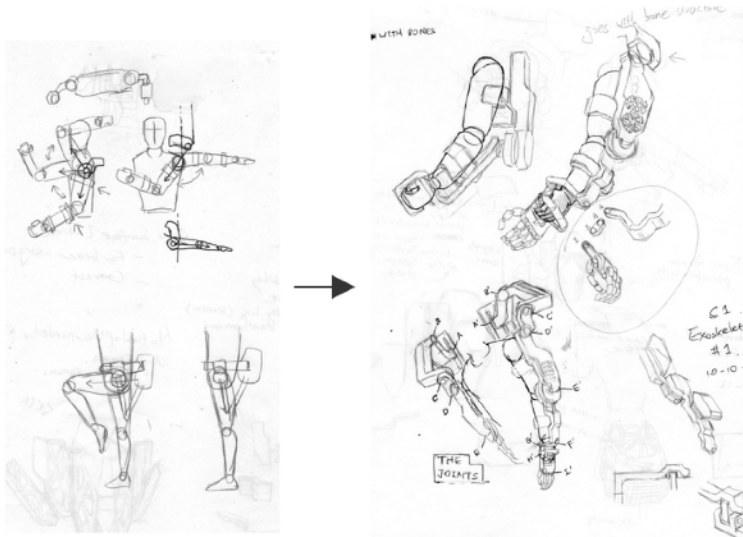

Figure 01.2: Exoskeleton Drafts

The robot character has a human-shaped robotic body, two extra robotic limbs, and a sensor pod as a 'head'. In the early design, he had a distantly controlled robot following him; this idea is presented in the block-out stage, but due to the increasing workload on the modeling, little time was left for this part. He wears a mask, which he can use to hide his 'face' and which reveals in part his personality. A Lamanism (Tibetan Buddhism) style mask was used as a reference for this, and was finally modified by an Angry Lord (Hayagriva)-type mask. In Chinese culture, the "Angry Lord" is known as "the Guardian with a Horse-Crown" or "the Leonine Dauntless Avalokitesvara". He is a symbol of sacrifice and justice.

After some research of costume design, fashion design, and 3D programs (Marvelous Designer 5), the author designed a hard-shell jacket, a shirt, and pants for this character – though without having made a definite decision as to whether the character would be wearing them or not. In the late modeling stage, the author decided against the jacket, as it blocked detail of his torso.

This character's pants were re-created during the costume design process; with cloth simulation features, the folds and shapes became much more realistic.

Regarding the character's two extra limbs, it should be mentioned again he is inspired by the Tibetan tradition of Avalokiteśvara. Avalokiteśvara is a bodhisattva who embodies the compassion of all Buddhas. This bodhisattva is variably depicted and described, and is portrayed in different cultures as either female or male.

The character has a similar silhouette to this bodhisattva, along with sharing certain other similarities such as: having no gender, having no certain physical form, having four or more arms, knowing everything, immortality, and possibly being a 'life-form' more advanced than the human being (from the AI's perspective, he believes he has self-consciousness, like a human, and an immortal existence).

Figure 01.3: Art depicting the four-armed Tibetan form
of Avalokiteśvara
Wikipedia

With little or no dialog, behaviors, or scene-setting depicted in the background, the author needed to convey all the information directly through the designs.

The author focused his design mostly on the sense of realism and level of complexity. The overall designs have strong qualities, in order to be appealing to the audience. All the information in the story's background, and which was held in mind during the process, will eventually be revealed in the designs.
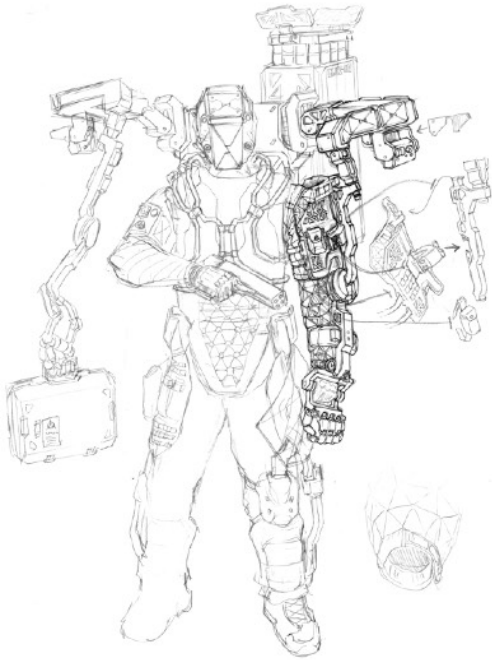
Implementation

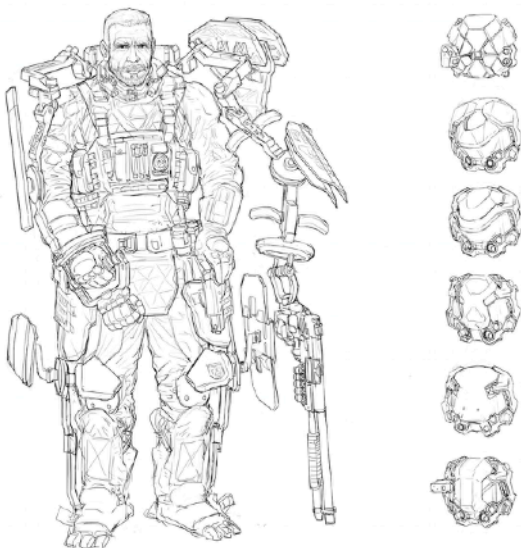## Early Ideation and Drafts

Figure 02.1: First Draft of "The Human"

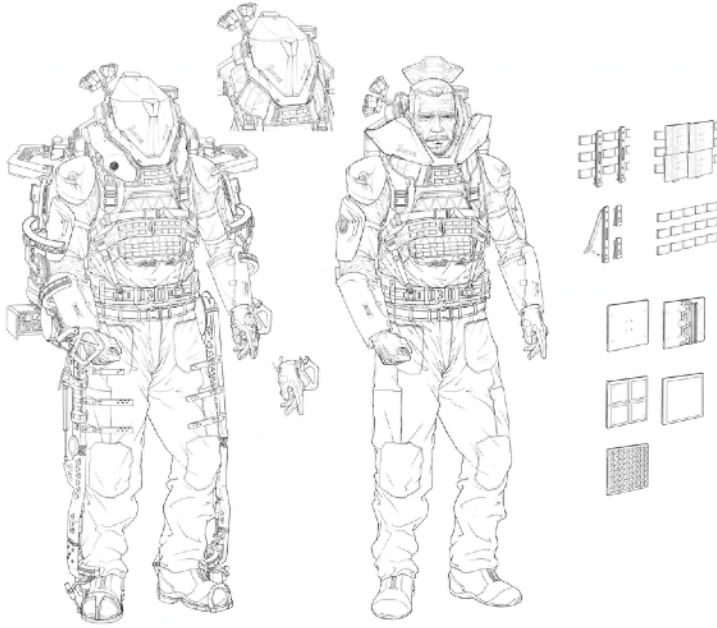Figure 02.2: Second Draft of "The Human",
Helmet Re-design

Figure 02.4: Final Draft of "The Human"
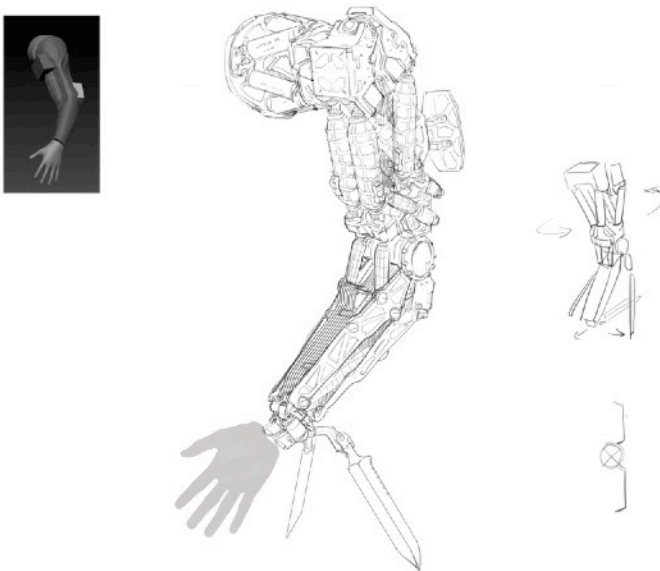Research Resource: (Lin, P., George B., & Keith A., 2013)

Figure 02.5: Draft of the Artificial Arm for Character
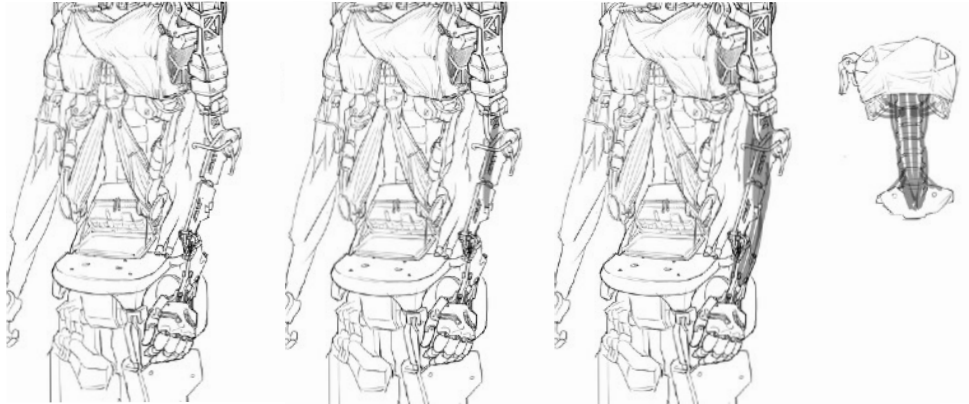"The Human"

Figure 02.6: ideal Development of "The Robot"(1/2),
Synthetic Muscles on Fore Arm
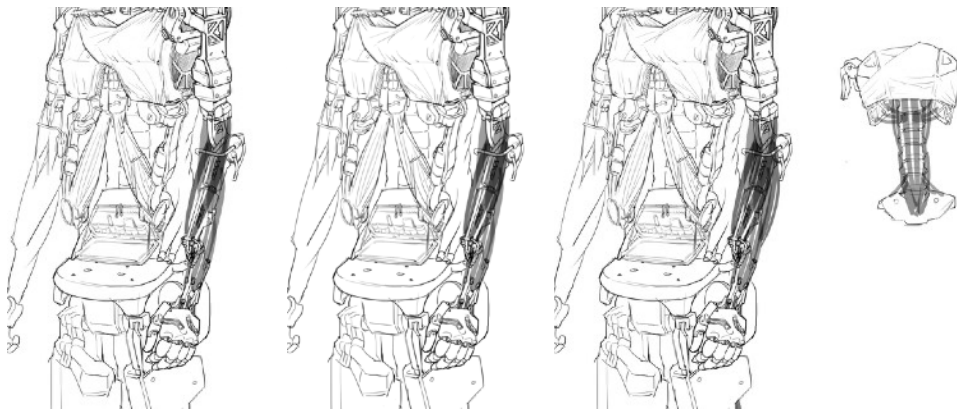Design Reference: (Gams, A., Tadej P., Aleš U., & Leon Ž 2013)

Figure 02.7: ideal Development of "The Robot"(2/2),
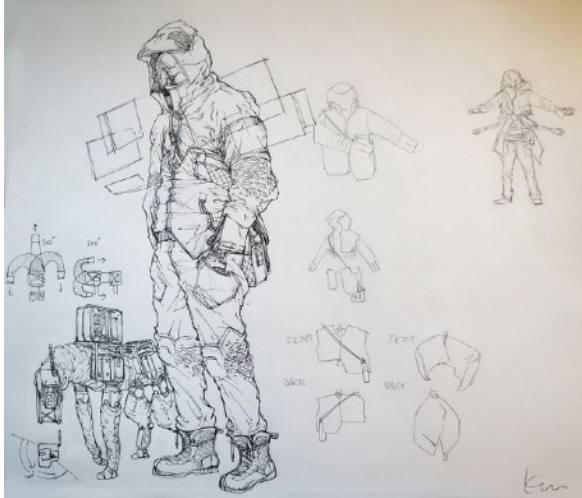Synthetic Muscles on Fore Arm
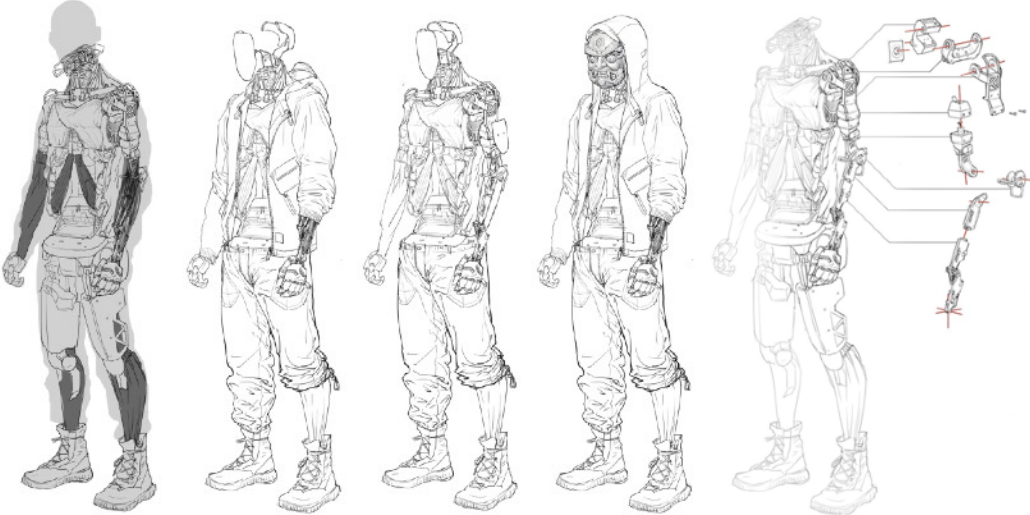
Figure 02.8: Early Draft of "The Robot"

Figure 02.9: Final Draft of "The Robot"

Modeling

Designing a character really refers to the whole process of constructing a visual representation of the character. That process often involves many steps, with the end result being something with which an audience can relate visually.

There were many mechanical parts in this research project that needed to be able to rotate or move freely. Thus, the author intended to develop the characters and props in such a way that the designs could continue developing in 3D programs, to test their 'functionality'.
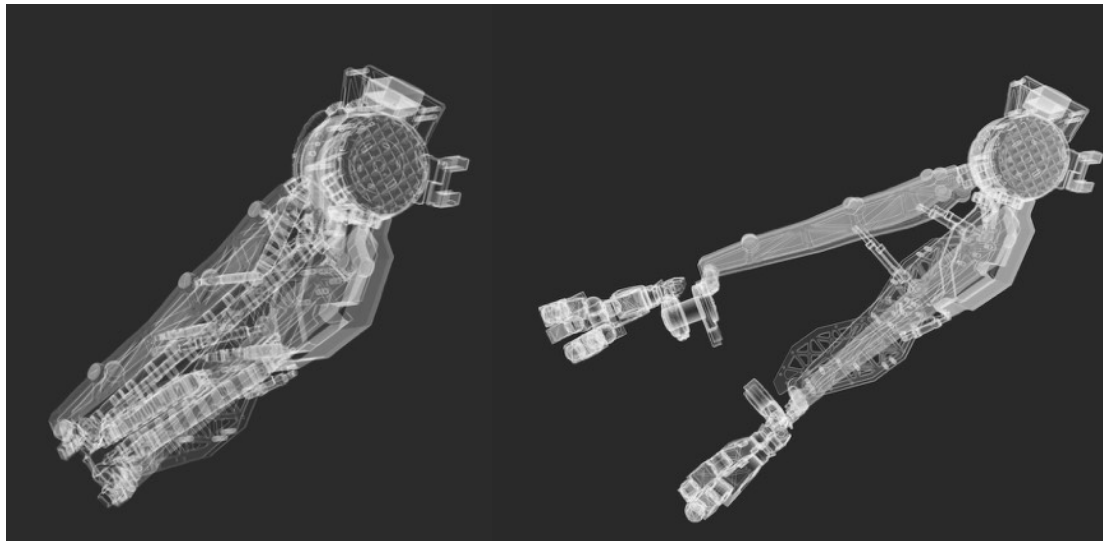

Figure 03.1: the Prosthetic Left Arm,
Piston Movement & Joint Configuration

The first step in a 3D modeling program is blocking out the body figure and major mechanical parts. In this regard, the design based on the early drafts continued to be developed in the 3D sculpture program. This is a critical step for robotic parts, in ensuring every object can move into the correct position, at the correct size, and serve the specific functions of that character.

The author started the modeling process with "The Robot" character first, then moved to the other one.Working on the characters simultaneously helped in attaining the same level of detail in both.

The model of the hand of "The Robot" and the artificial arm of "The Human" were started right after the block-out stage. In the following steps, these parts were used as a standard to synchronize the modeling of the other parts of each character.
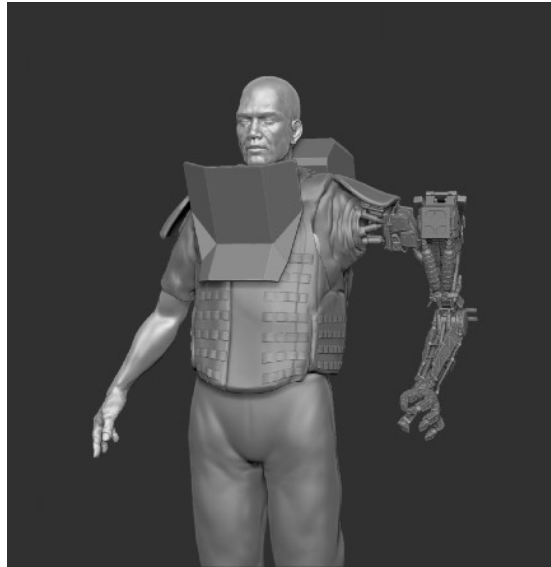
Character of "The Human", Block-out
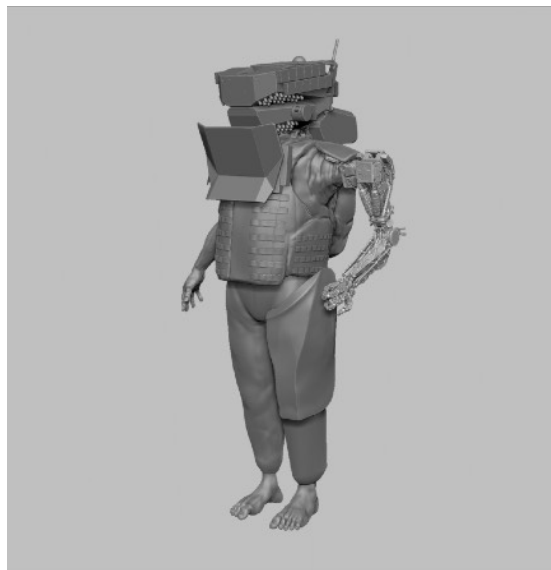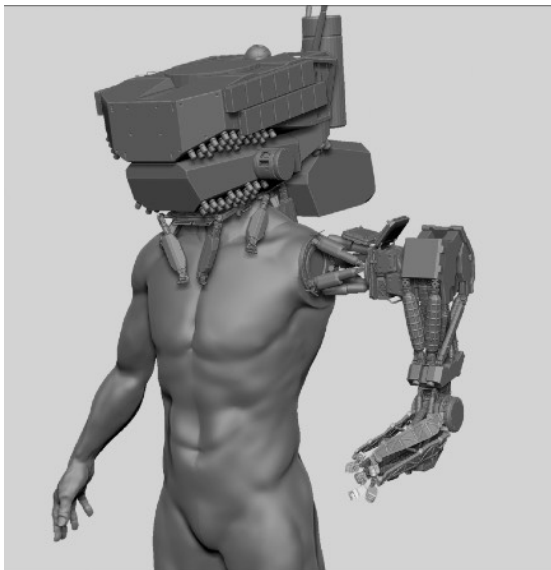

Figure 03.2: "The Human" Block Out (1/2)

Figure 03.3: "The Human" Block Out (2/2),
Helmet / Costume

Character of 'The Robot', Block-out
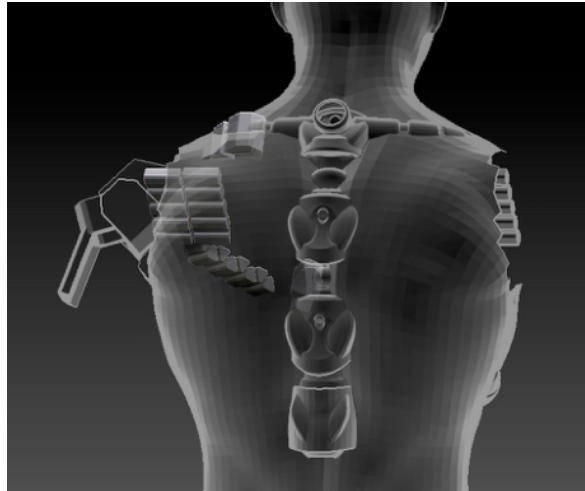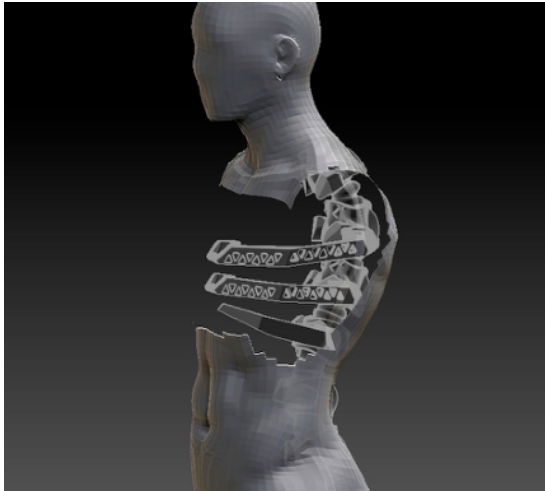
Figure 03.4: "The Robot" Block Out (1/2)
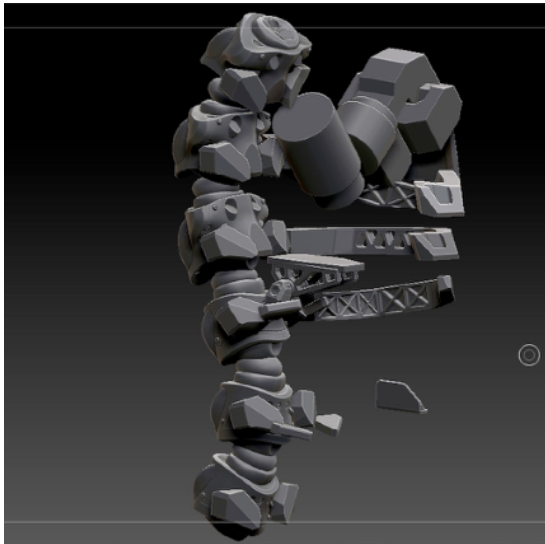
Figure 03.5: "The Robot" Block Out (1/2), Torso

Character of "The Robot", Hands
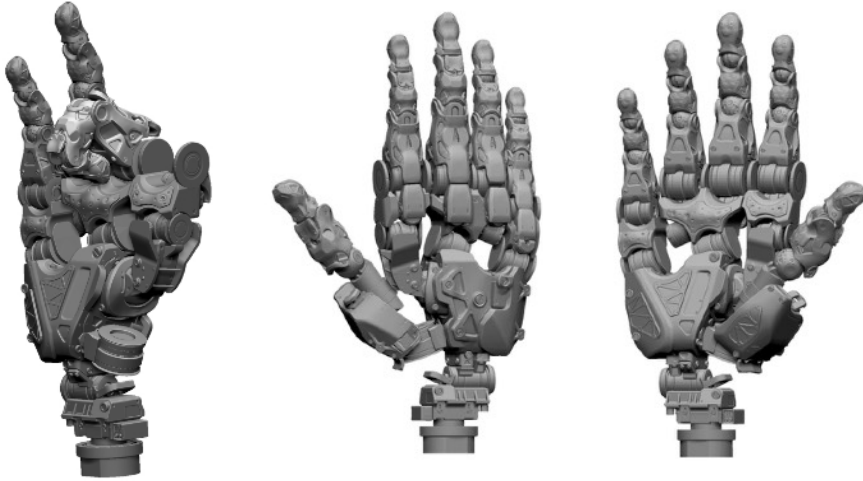
Figure 04.01: "The Robot" Parts,
Hand and Robotic Arm
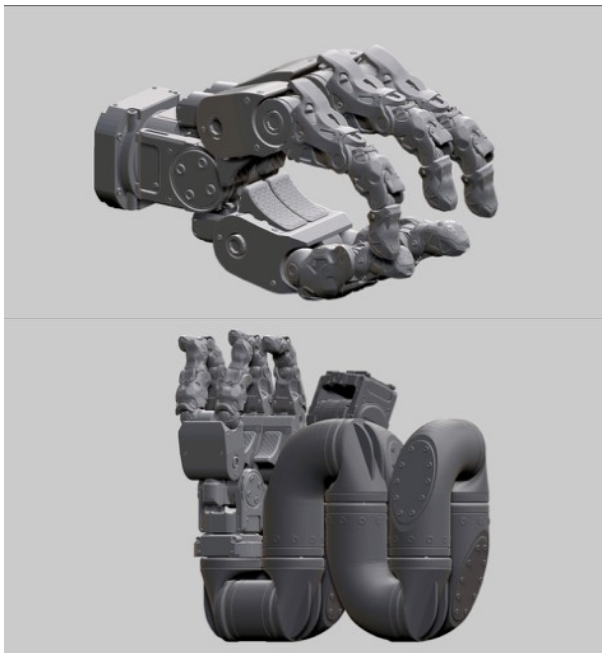
Figure 04.02: "The Robot" Parts,
Simian-Inspired Robotic Arm

Character of "The Human", Artificial Arm
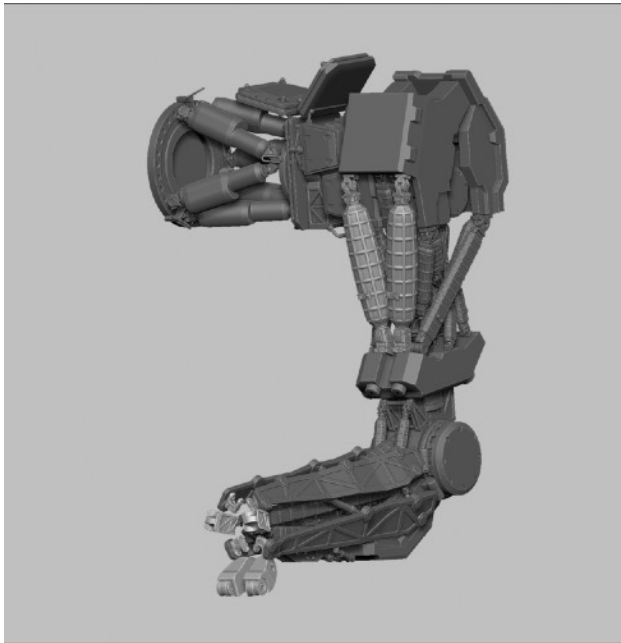
Figure 04.03: "The Human" Parts,
Artificial Arm Work in Progress
Re-designed
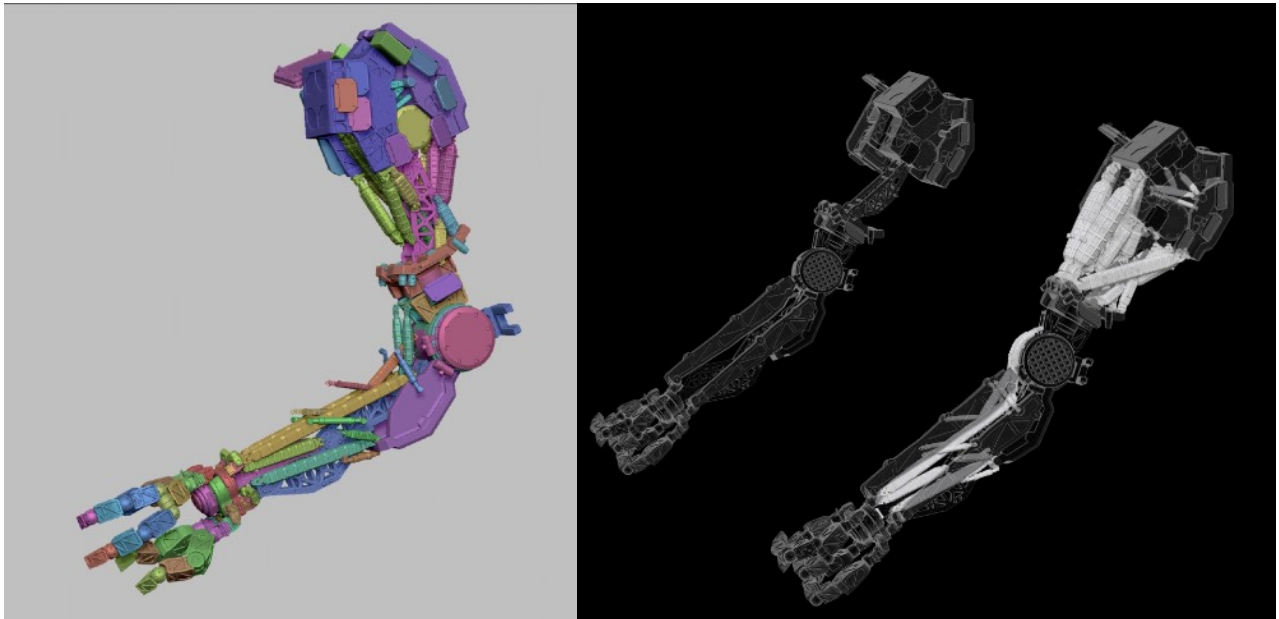
Figure 04.03: "The Human" Parts,
Artificial Arm

Props Design and Modeling

Figure 04.04 / 04.05: "The Robot" Prop,
Weapon / Messenger Bag
Design Reference: (Eward, 2012)

Figure 04.06: "The Robot" Prop,
Mask
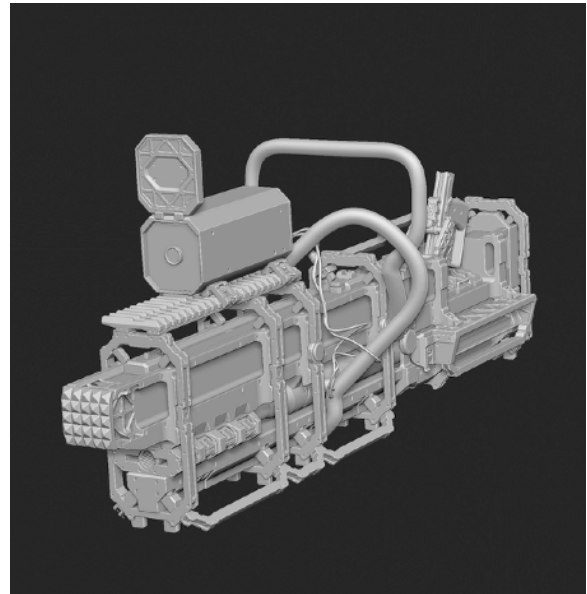
Figure 04.07: "The Human" Prop,
Weapon
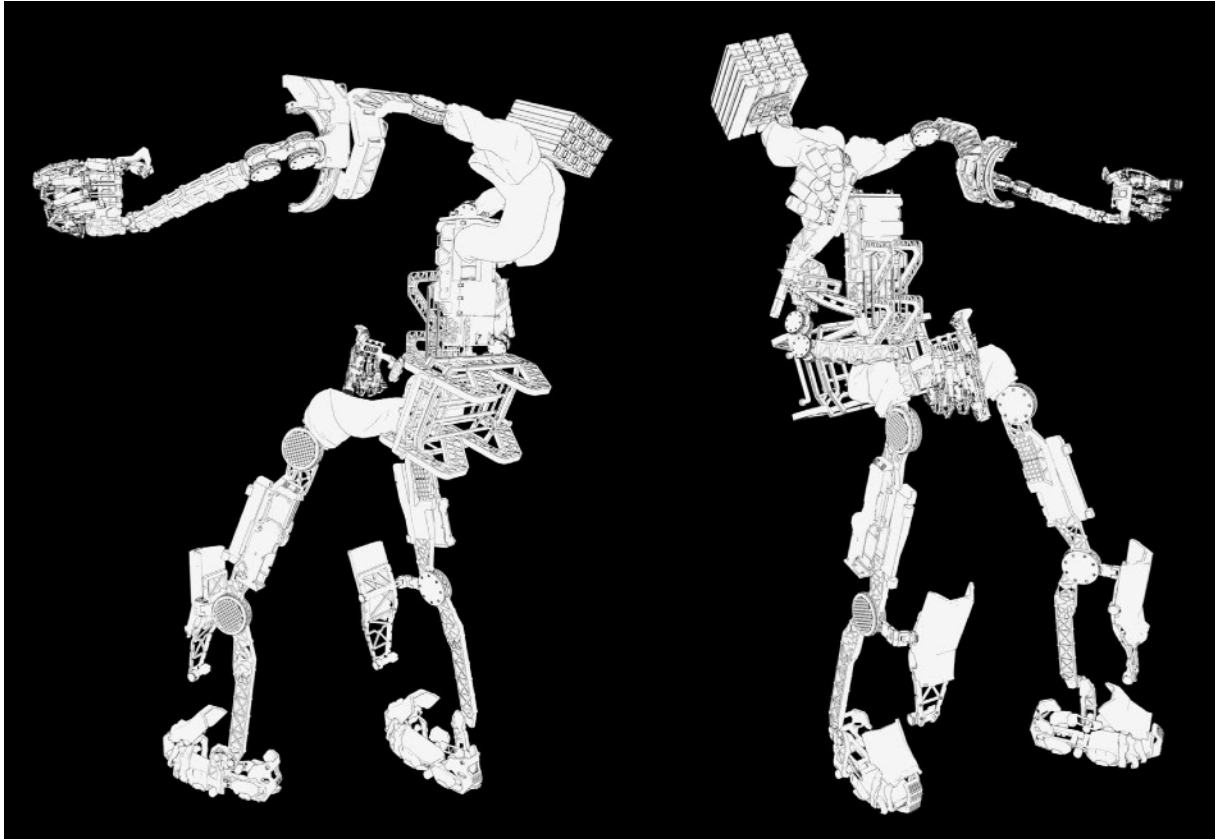
Figure 04.08: "The Human" Parts,
Exoskeleton Re-designed

Costume and Fabric

An attempt was made to use ZBrush and Maya's fabric simulation function to create costumes and fabrics, but this was not satisfactory. Marvelous Designer was then used.
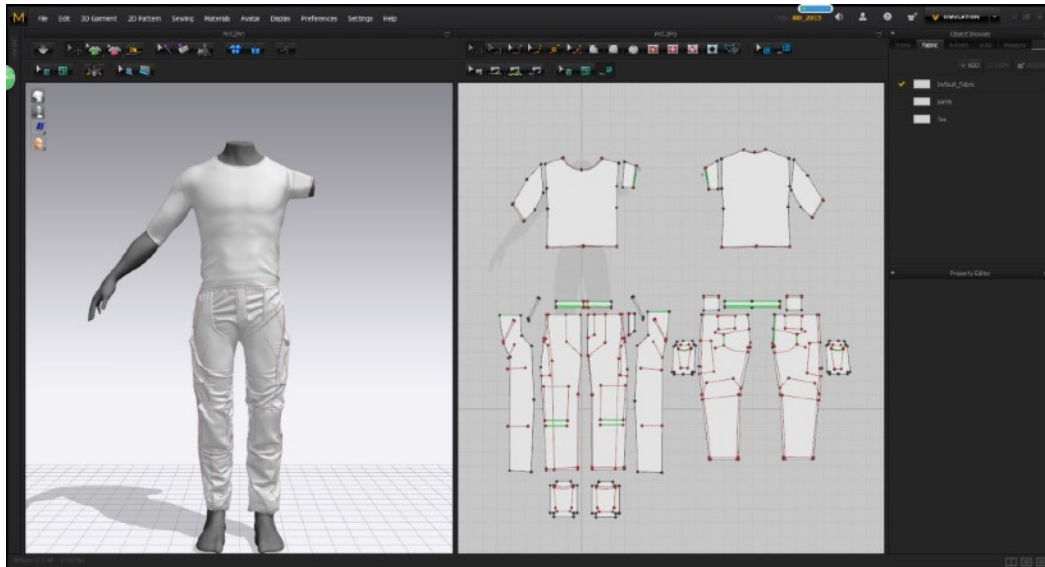
Figure 04.09: "The Human" Costume
In Marvelous Designer
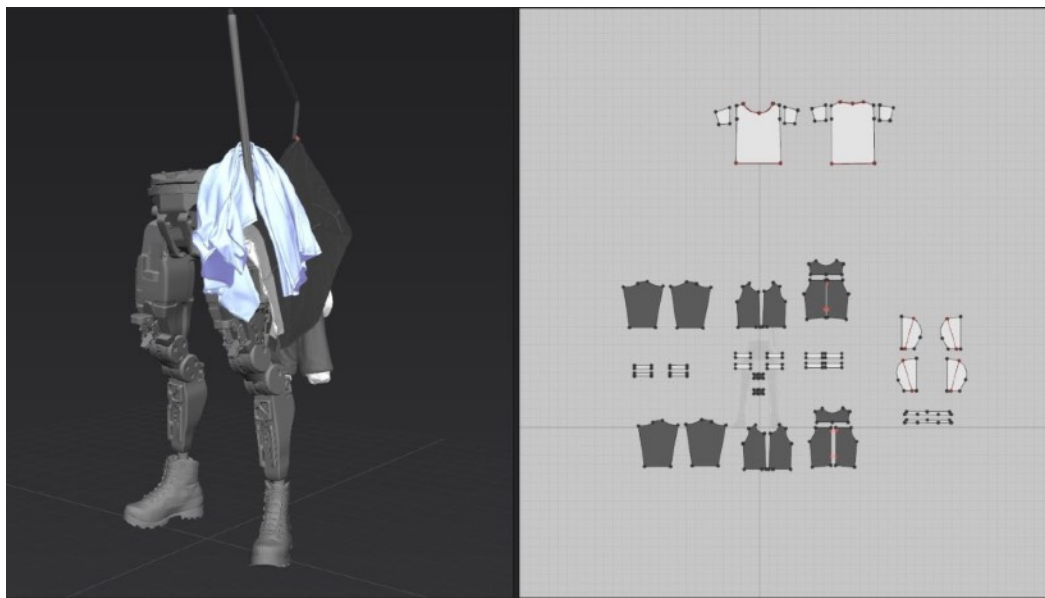
Figure 04.10: "The Robot" Costume (Re-designed)
In Marvelous Designer

Finished Modeling
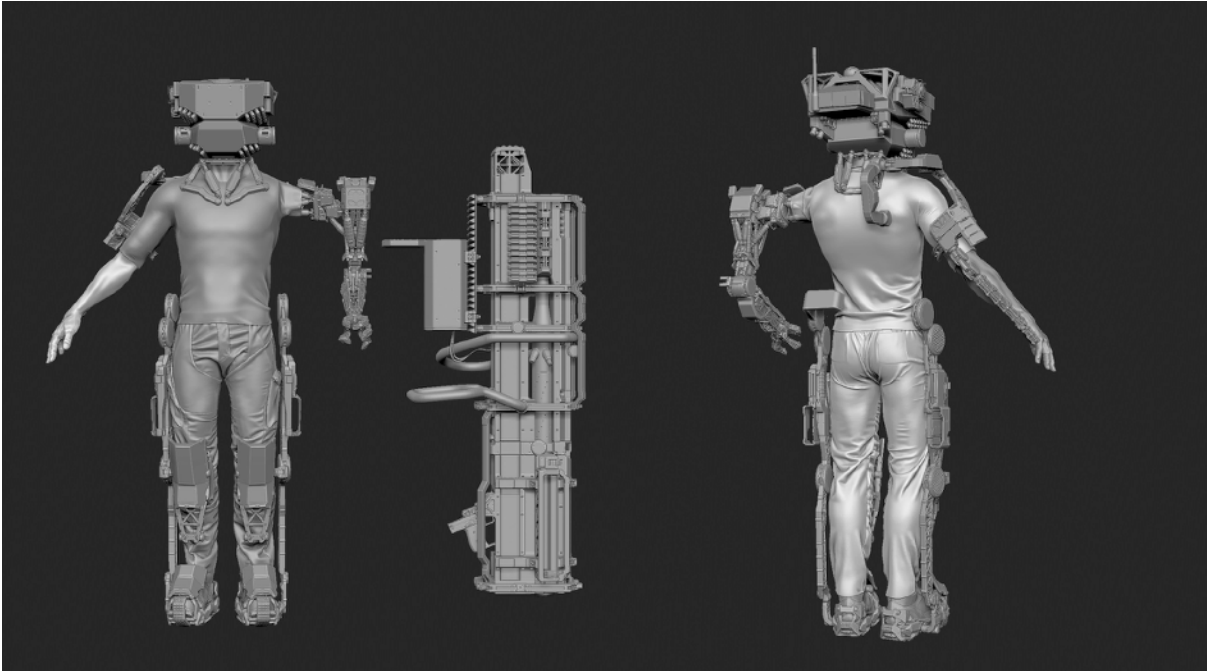
Figure 04.11: "The Human",
Modeling Done

Figure 04.12: "The Robot", Early Version

Re-design of "The Robot"

Figure 04.13: Re-designed Head of
"The Robot", Render Test
(Eward, K. 2012)

Figure 04.14: "The Robot" Final Version,
Head / Costume Improved
Modeling Done

Texturing and Rendering

The models are high-poly, and complicated; the final deliverables will be images and turntable animations. Several tests were run in Maya Mental Ray and Keyshot real-time renderer, and it turned out Keyshot can handle a much heavier mesh, and is more efficient.
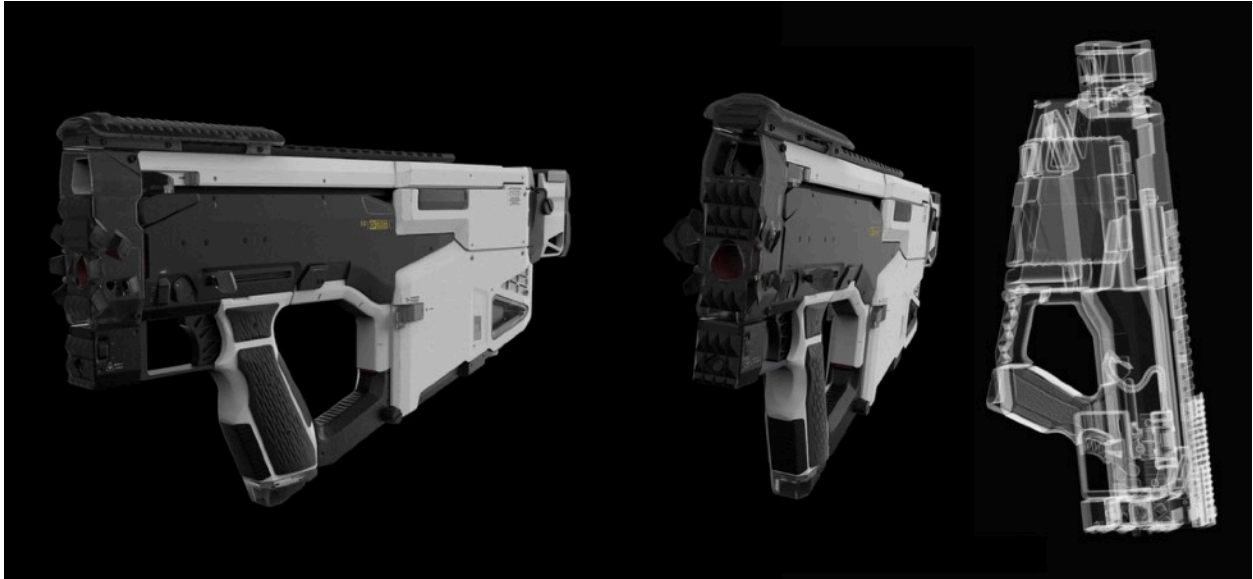
Figure 05.1: A Render Test Done in Keyshot

Figure 05.2: "The Human" (1/2),
Textured
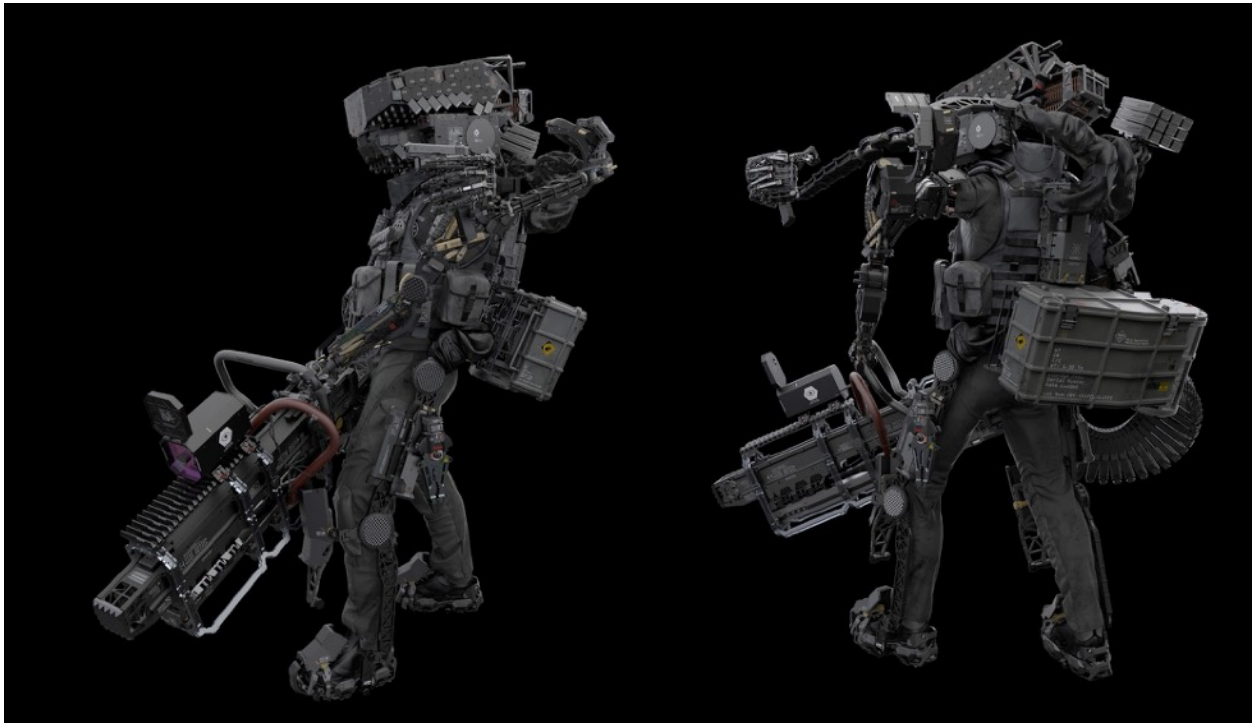
Figure 05.3: "The Human" (2/2),
Textured

Figure 05.4: "The Human", a Close-up render

Figure 05.5: "The Robot" (1/2),
Textured

Figure 05.6: "The Robot" (2/2),
Textured

Figure 05.7: "The Robot", Close-up render

Final Render and Image Compositing

Figure 06.1: "The Human" with Background

Figure 06.2: "The Robot" with Background

Demonstration

I also made four turntable animation and several renders for demonstration purposes.

Figure 07.1: "The Human", Turntable Animation
on Vemio.com
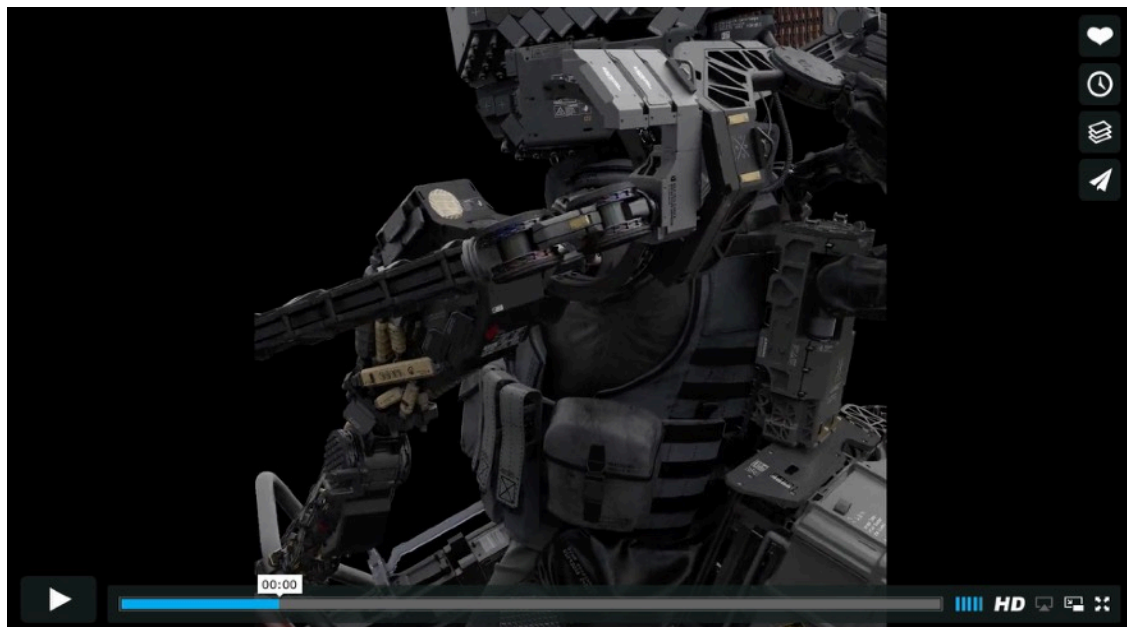
Figure 07.2: "The Human", Turntable Animation Close-up
on Vemio.com

An Explanatory Brochure

Due to their complexity, a brochure was created to give people a better understanding of the characters. This contains render images of several important components and details for each character, with descriptions.

See figure 8.1 and 8.2 for samples of the brochure.
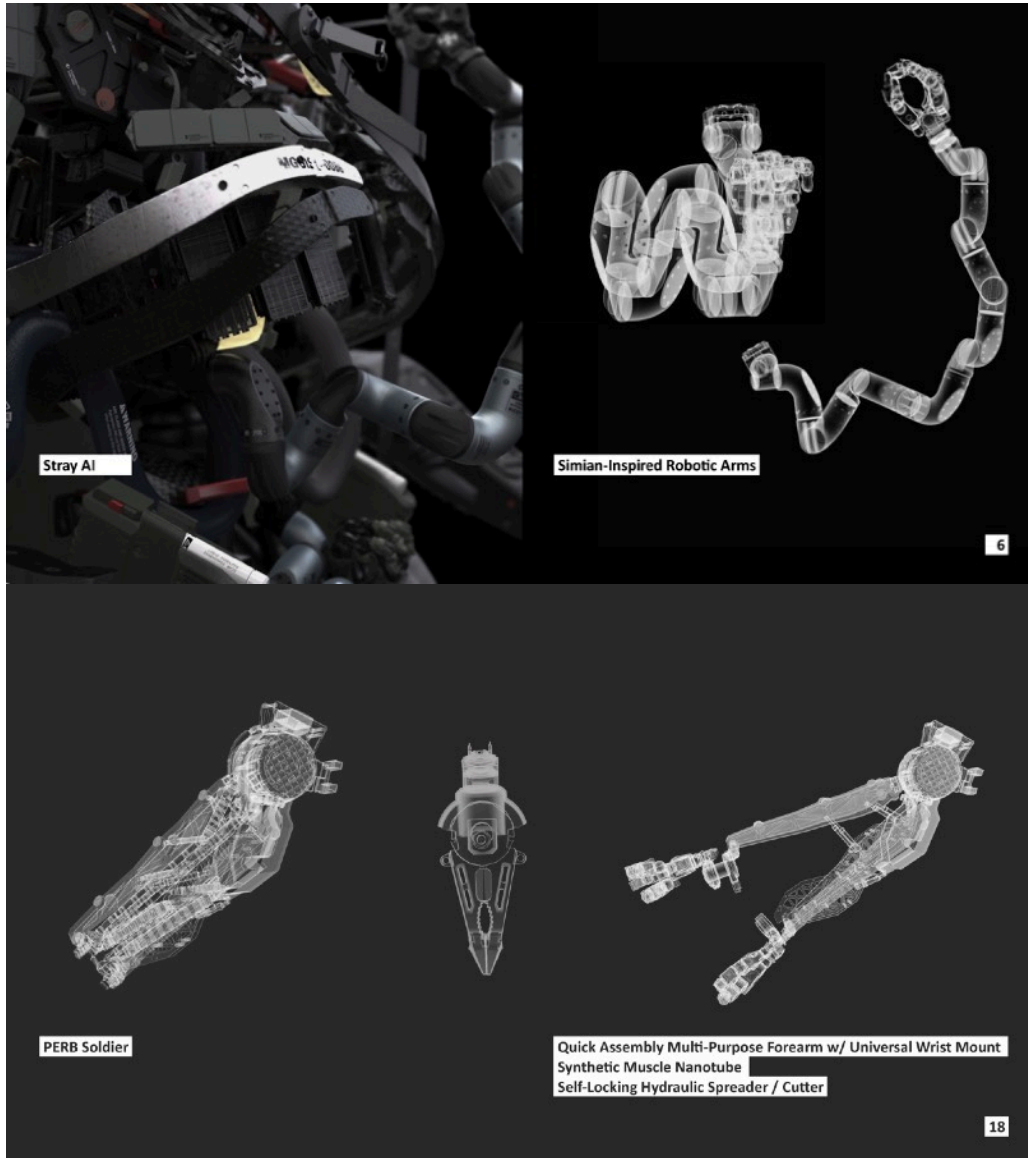
Figure 08.1: the Brochure,
Page 6 and Page 18
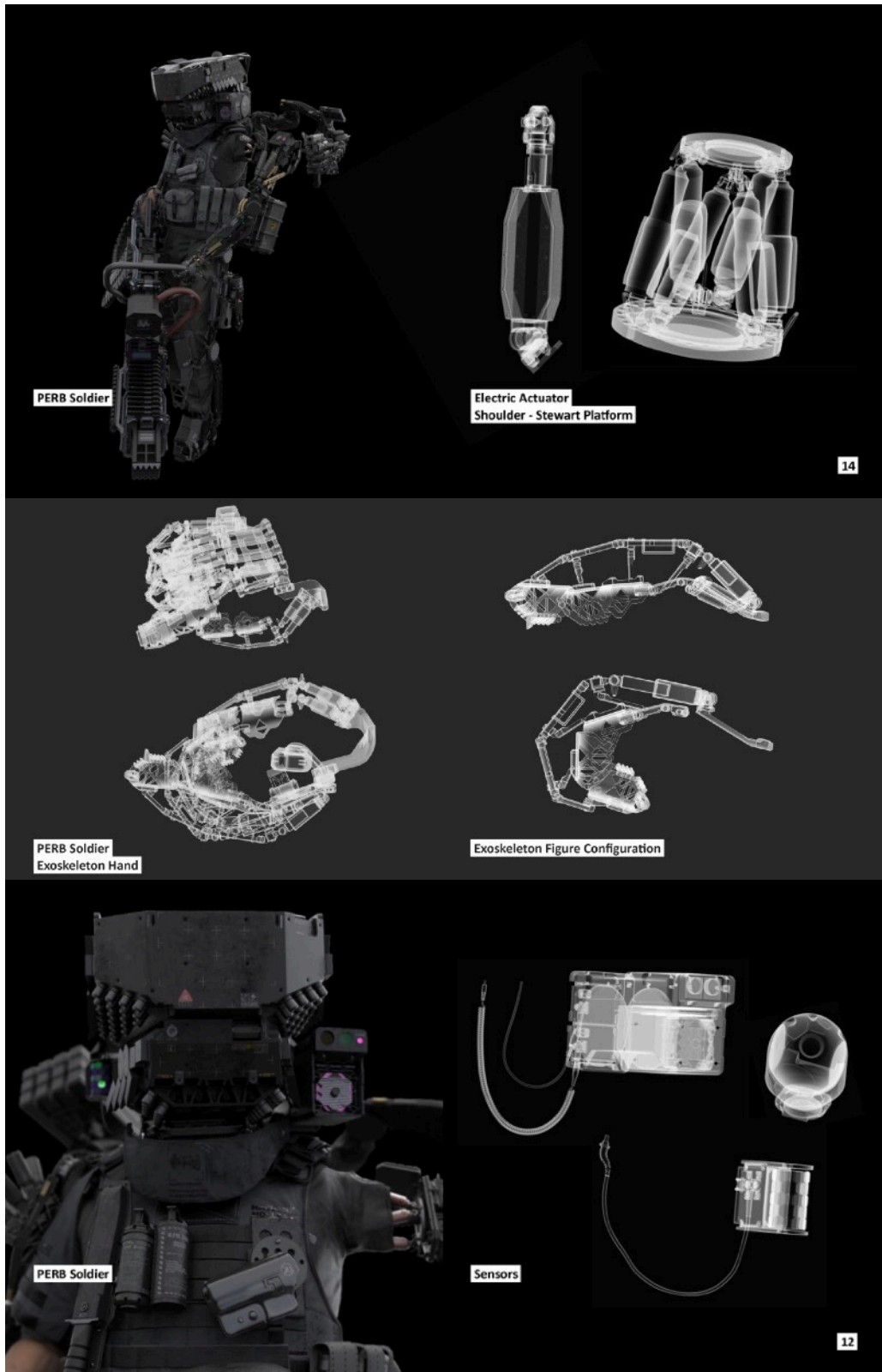
Figure 08.2: the Brochure
Page 14, 19 and Page 12

Summary

This project has focused on bringing realism to two sci-fi characters, through research, modeling, and the providing of details. Considerable thought is involved when doing character design in a rigorous way, but using present day technology as a reference point can be a great benefit in creating thoughtful design.

Better computing power, advanced design tools, and good flow in one's work, all contribute to creating highly detailed 3D modeling more easily, and this research has shown the possibilities for creating complex 3D models quickly and efficiently. During this process, I have learned a variety of different 3D modeling techniques, and gained confidence for executing any type of modeling job in the future. Most importantly of all, this project allowed me to dive deeper into design thinking and the research process. I have learned a great deal about how design works, and discovered a number of methods for improved implementation of possible future designs.

For the above reasons, in creating these science fiction characters, I have been inspired by existing technologies in regards to human prosthetics and augmentation. Real-life technologies have been of great help in developing a more appealing and realistic look for the characters; they have informed many of my design decisions during this process, assisting me in developing deeper design thinking for current and future work.

Conclusion

Science fiction often examines the possibilities and implications of new technologies; new innovations are picked up and elaborated on in terms of what they might be, and how they might be used. This exchange works in both directions _ sometimes the technology actually makes its first appearance in science fiction, then becomes reality, and other times the 'real' technology comes first, and science fiction authors then speculate about it, and how it might be used,or affect the human condition. The 'accuracy' of the technology portrayed, similarly, can span a wide range. Sometimes it is existing technology, sometimes it is a physically realistic portrayal of a far-off technology, and sometimes it is simply a plot device that might look scientific, but has no basis in science at all.

The task of science fiction is not to predict the future – but rather, to contemplate possible futures. Often people find the future appealing precisely because it cannot be known. But with enough substantive materials embedded into the design, sci-fi characters can be very appealing, highly believable and sufficiently detailed that people feel they are actually seeing the future.

To experiment with plausible futures is to envision where contemporary social trends and recent breakthroughs in science and technology might lead us. Today, Microsoft, Google, Apple, and many other companies organise sponsored lectures, in which sci-fi writers give talks to employees, and then meet privately with developers and research departments. Perhaps nothing better demonstrates the close ties between science fiction and modern technology than what we call "design fiction" imaginative works, commissioned by tech companies to model new ideas. This reveals how close a bond it is, in tying fictional work of visual interest and depth to real technology and the 'real' future of human beings.

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Accessed October 6, 2013
http://ethics.calpoly.edu/ONR_report.pdf

Appendix

The Brochure

"The Robot" aka "Stray AI"
"The Human" aka "PERB Soldier"

BELIEVABLE SCI–FI
CHARACTER DESIGN
BASED ON
SUBSTANTIVE MATERIALS

BY
KUN DONG

CHARACTER 01
STRAY AI
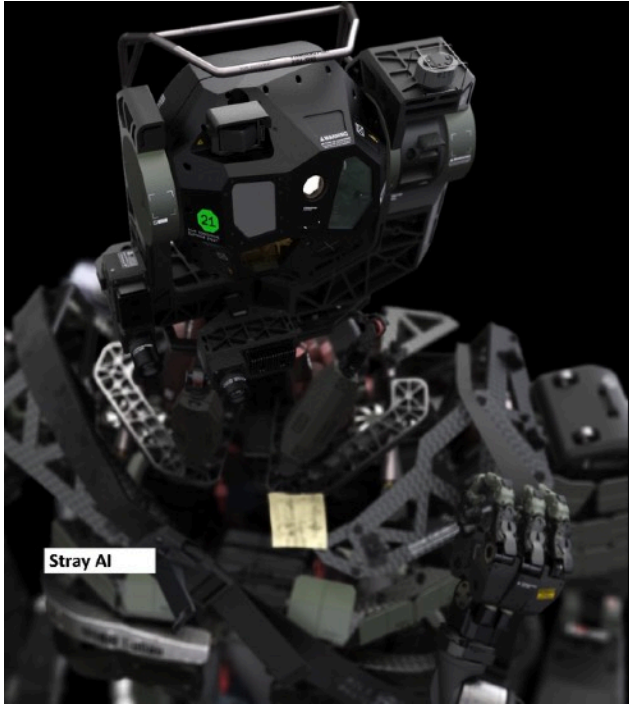
Stray AI
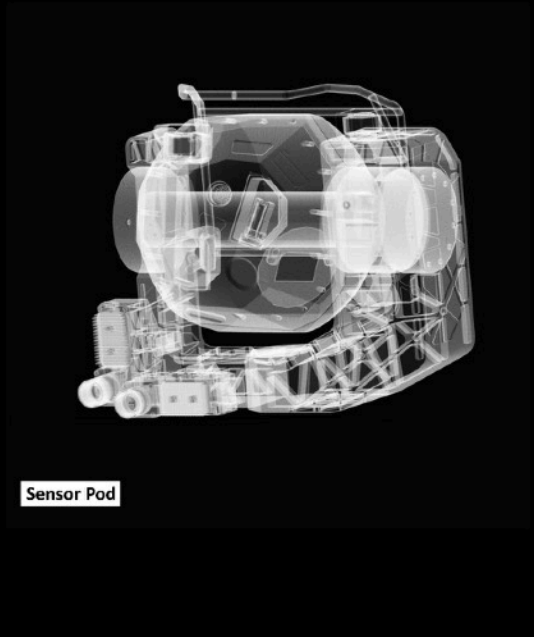
Sensor Pod

2
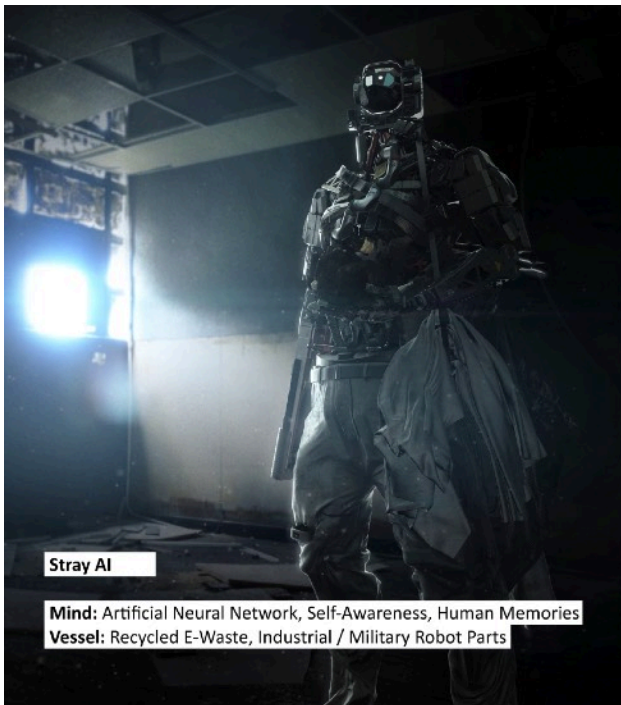
Stray AI

Mind: Artificial Neural Network, Self-Awareness, Human Memories
Vessel: Recycled E-Waste, Industrial / Military Robot Parts
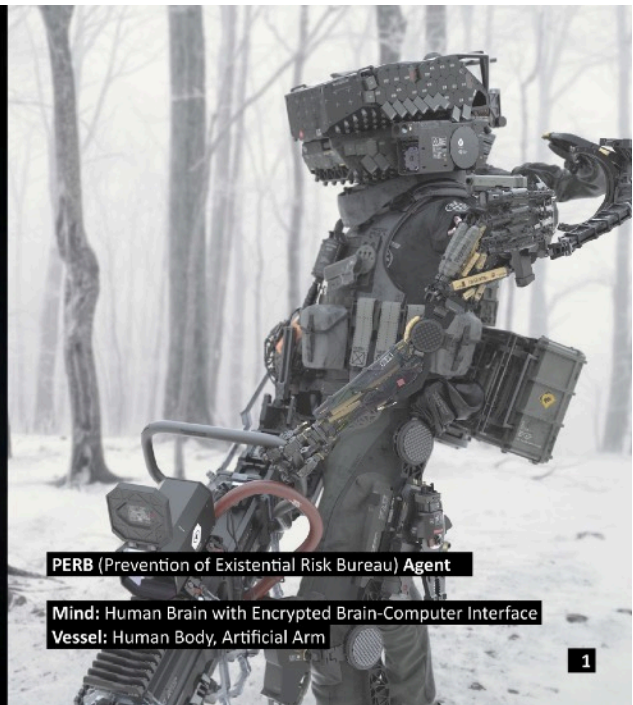
PERB (Prevention of Existential Risk Bureau) Agent

Mind: Human Brain with Encrypted Brain-Computer Interface
Vessel: Human Body, Artificial Arm

1

Stray AI
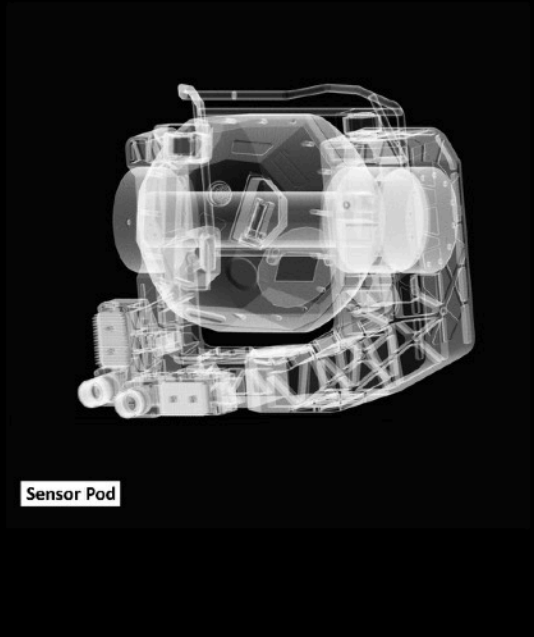
Sensor Pod

Stray AI

Sensor Platform (Neck)

Stray AI

Heavy Duty Artificial Hand

4

Stray AI

Military Humanoid Robot Torso
Pistons

5
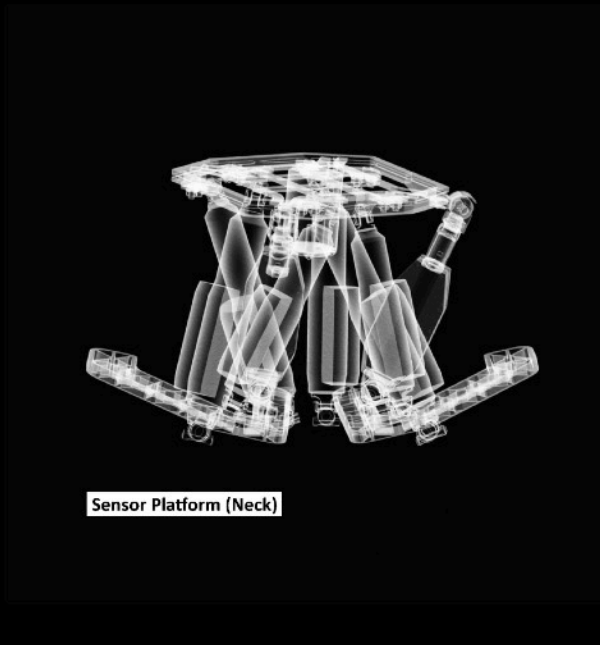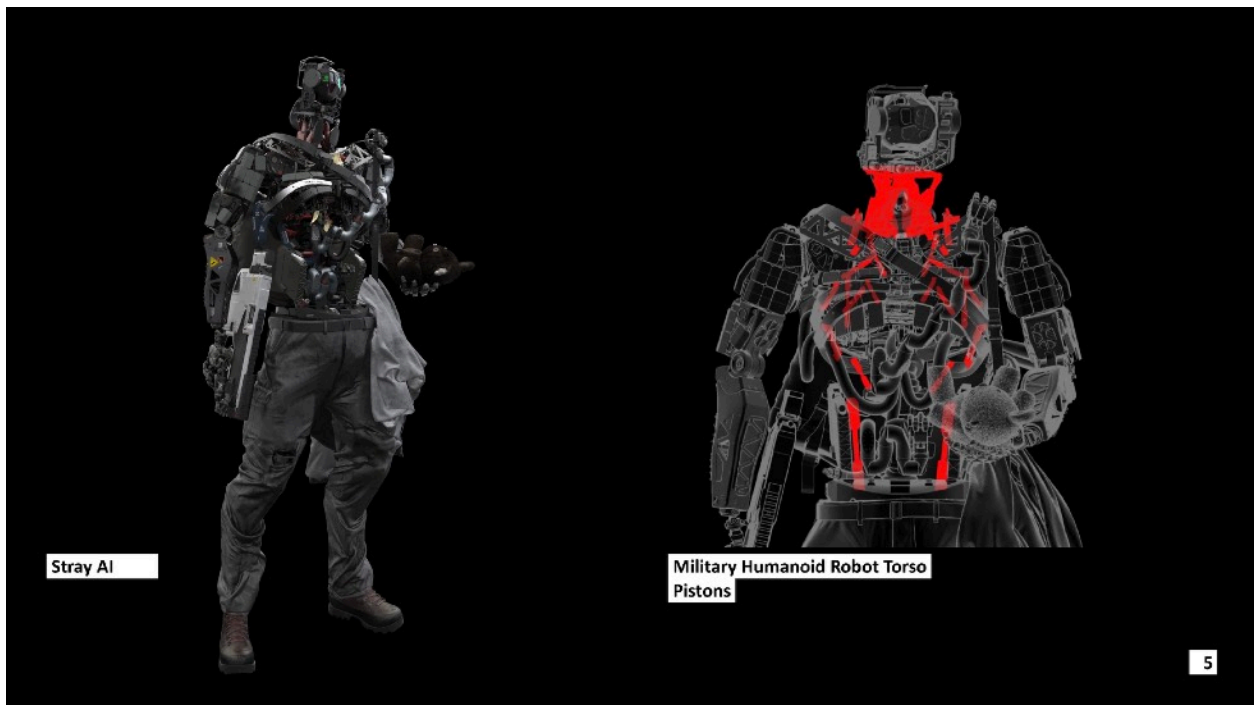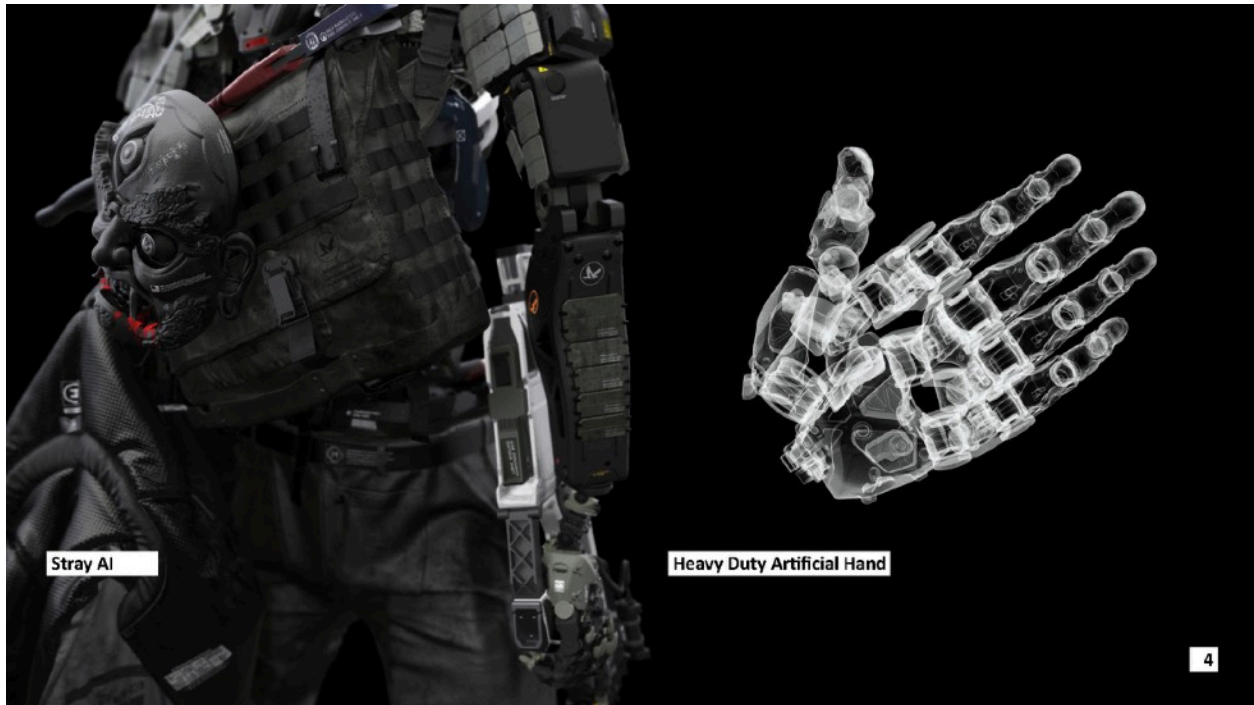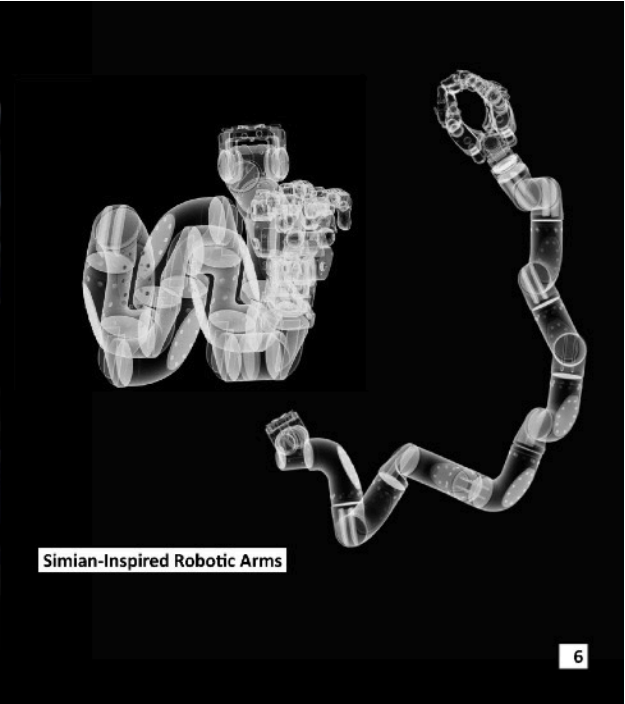
Stray AI

Simian-Inspired Robotic Arms

6
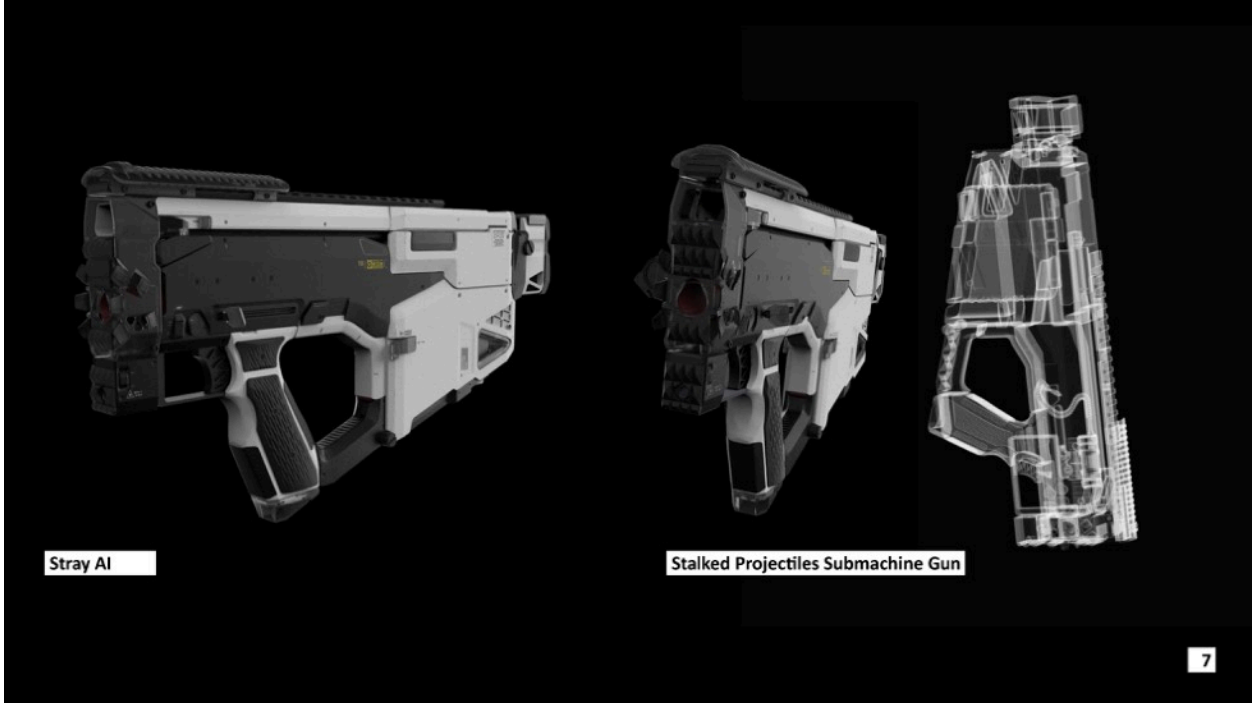
Stray AI

Stalked Projectiles Submachine Gun

7

Stray AI

Artificial Brain
Memory Module

8

Stray AI

Processors

9

Stray AI

Circulation Cooling System

PERB Soldier

Armored Helmet

PERB Soldier

Sensors

PERB Soldier

Cooling & Ventilation Module

PERB Soldier

Electric Actuator
Shoulder - Stewart Platform

14

PERB Soldier

MOLLE Vest with Bullet-Proof Inserts

15
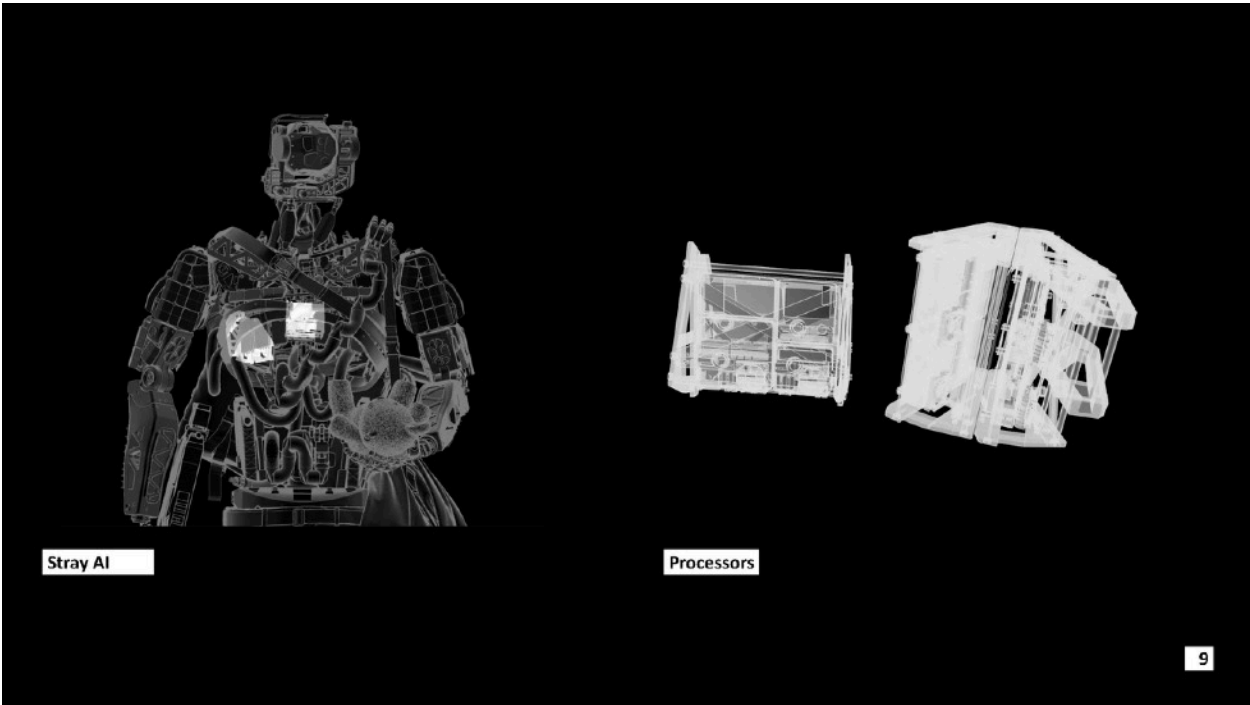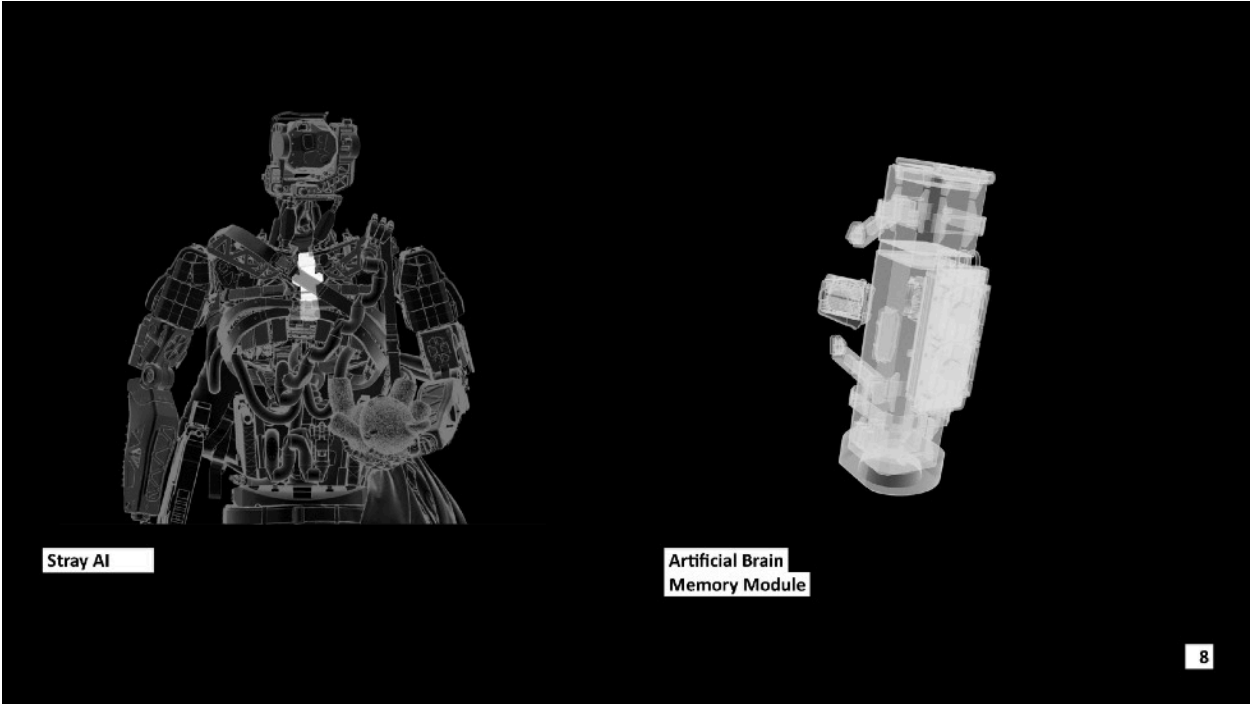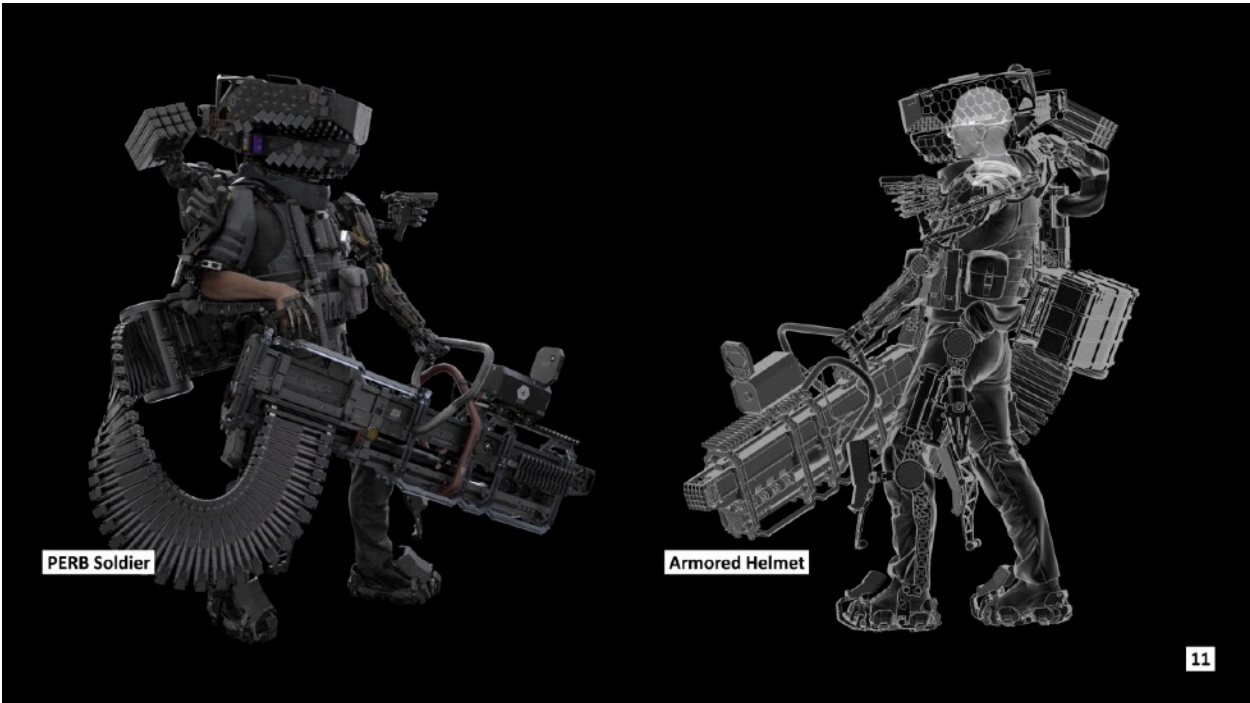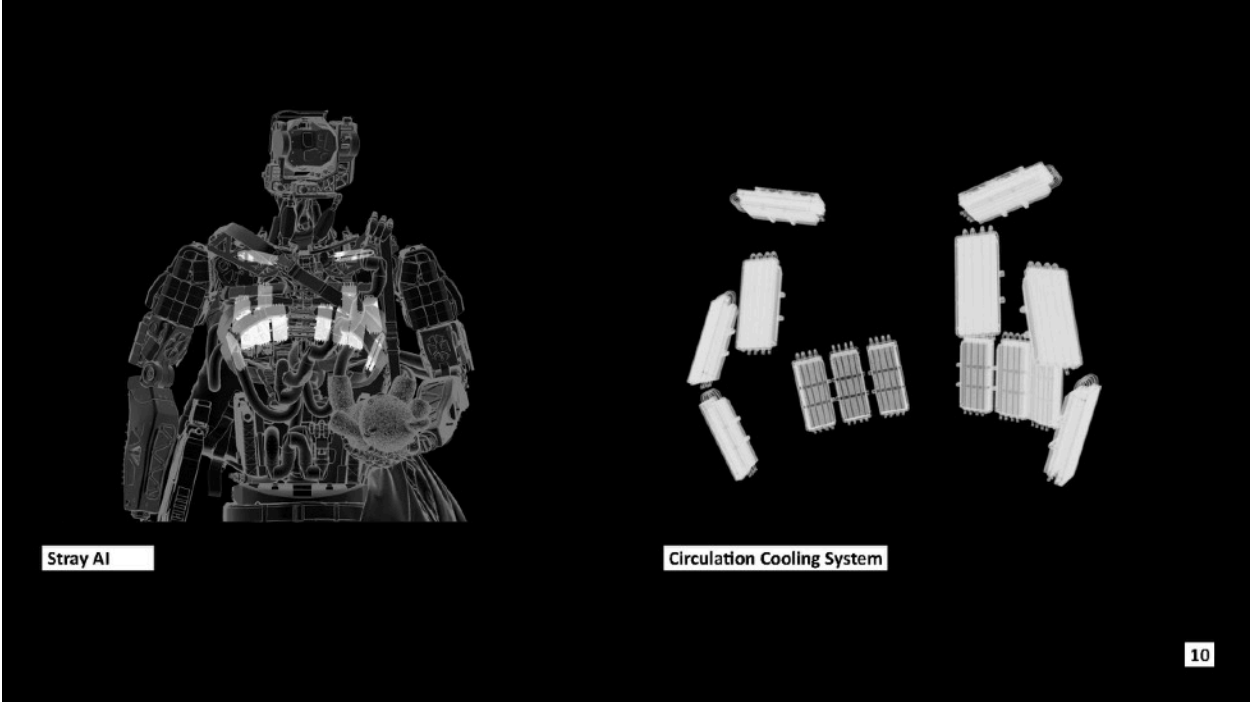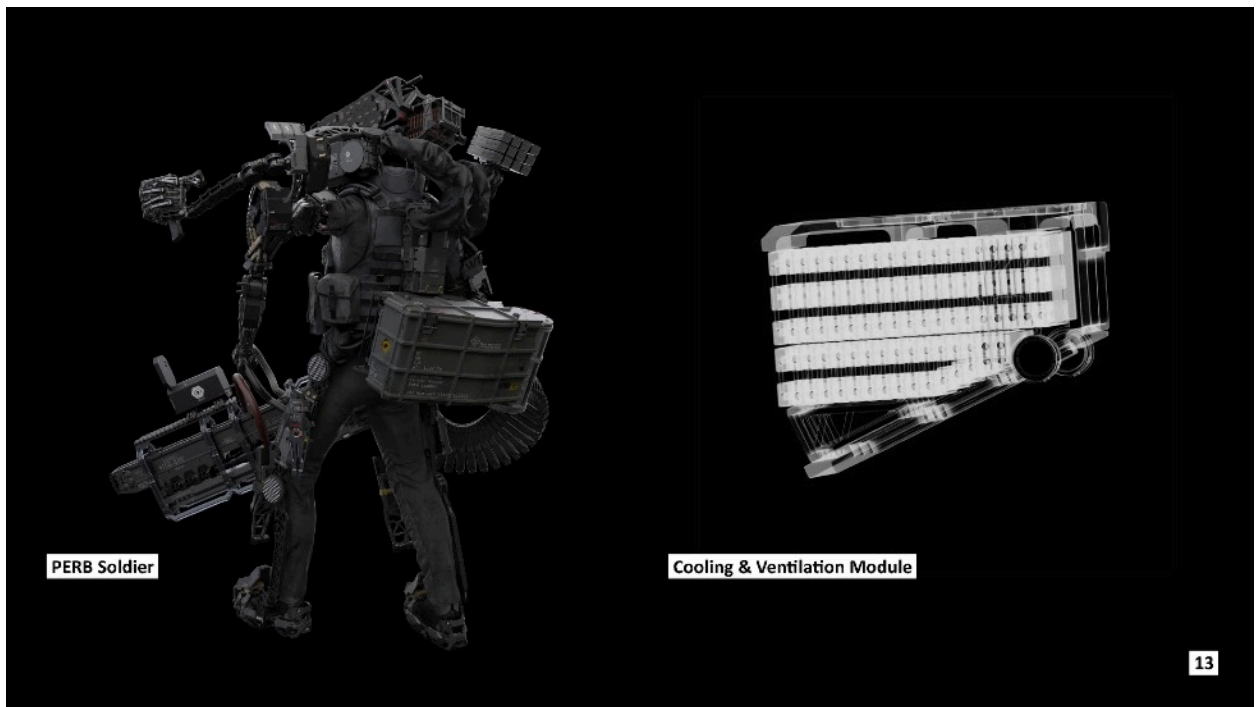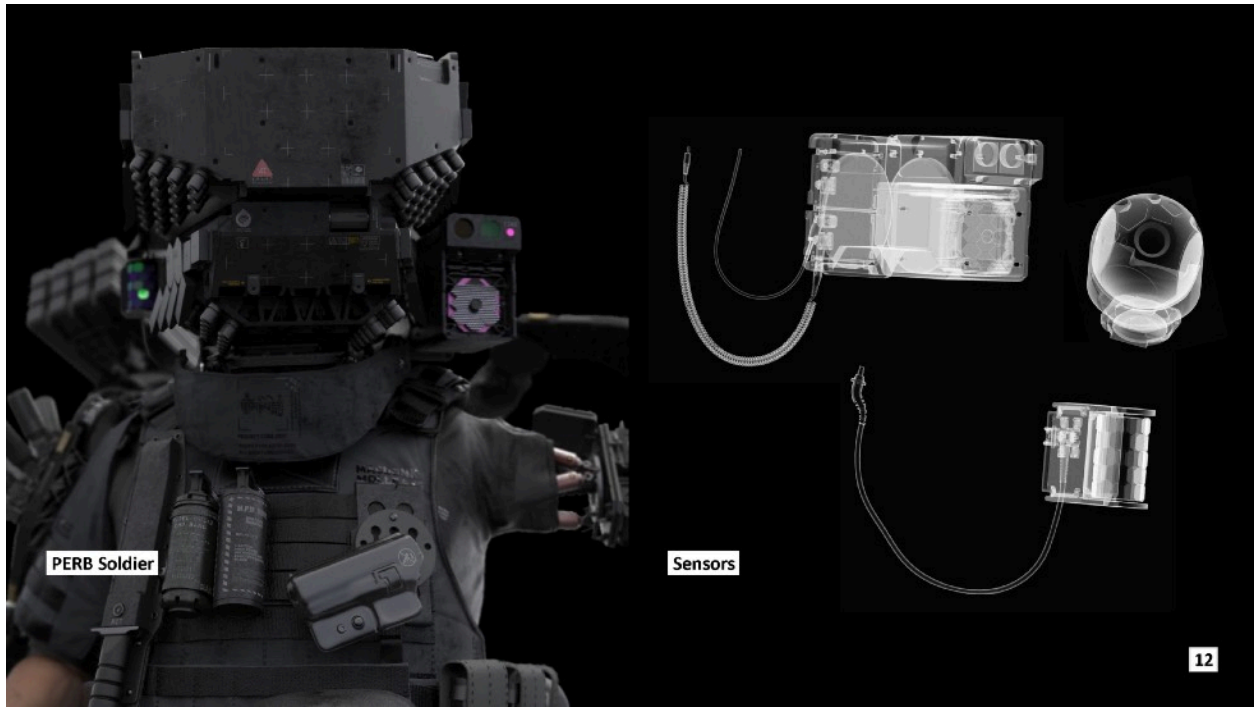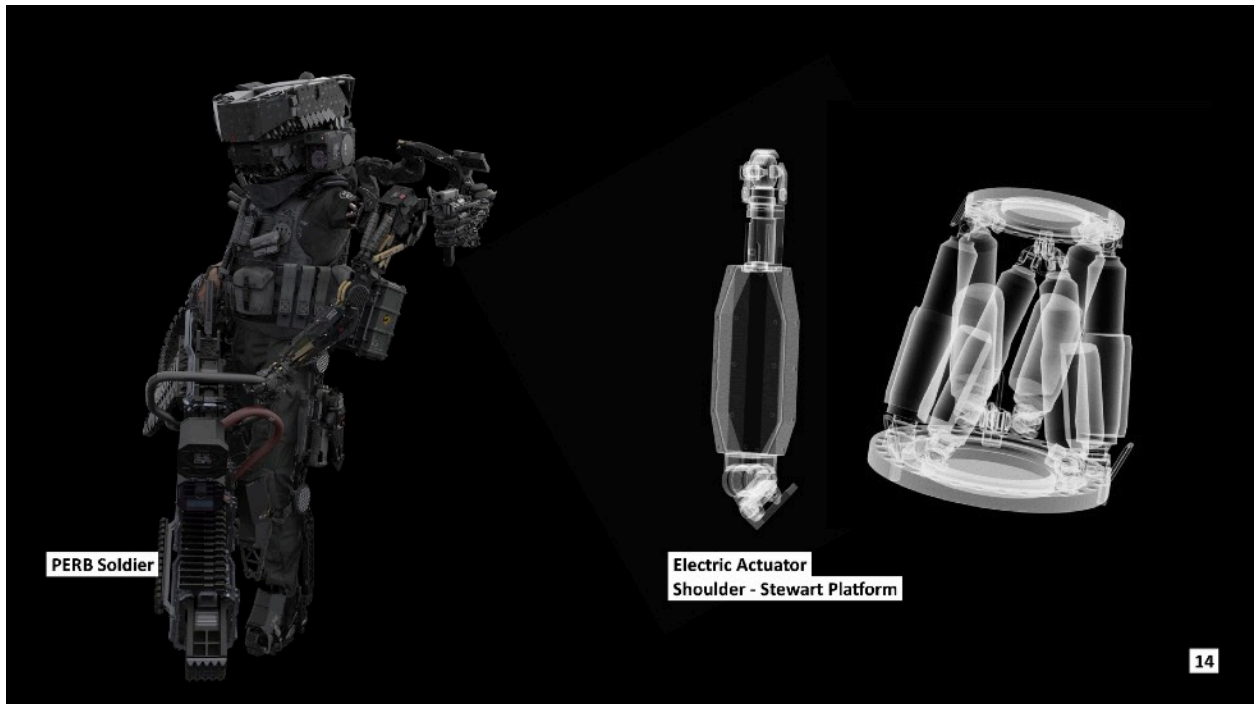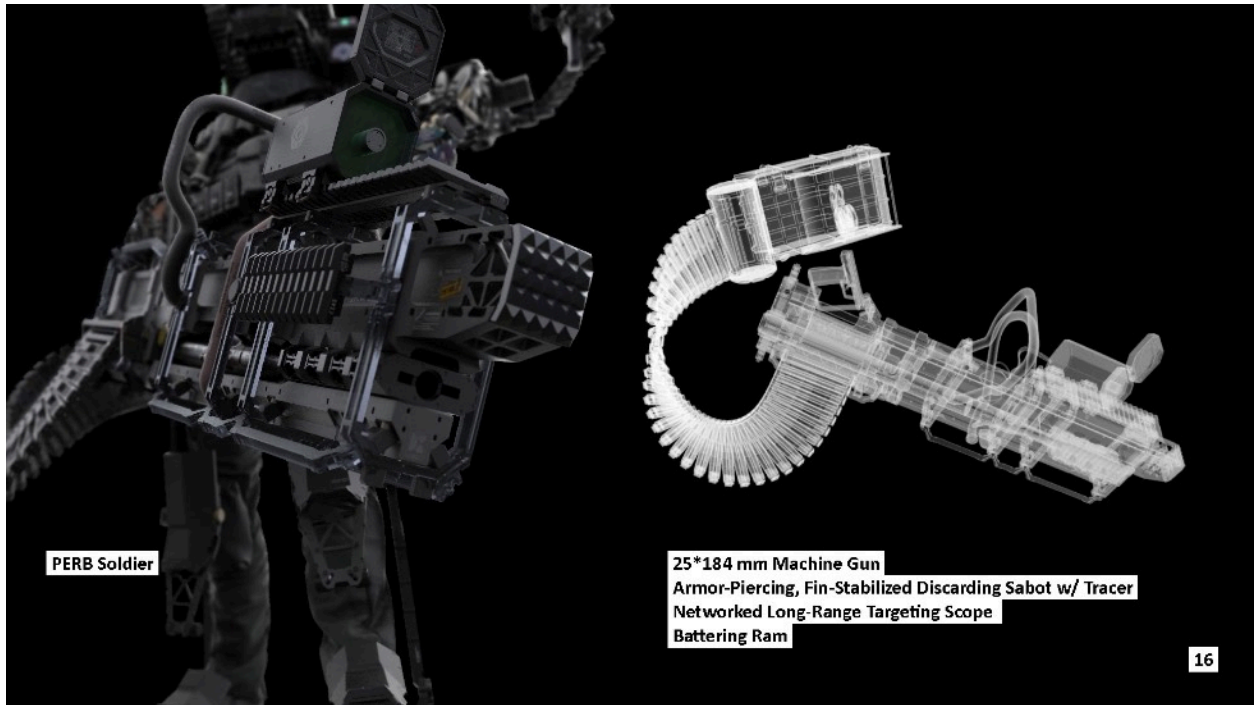
PERB Soldier

25*184 mm Machine Gun
Armor-Piercing, Fin-Stabilized Discarding Sabot w/ Tracer
Networked Long-Range Targeting Scope
Battering Ram

16
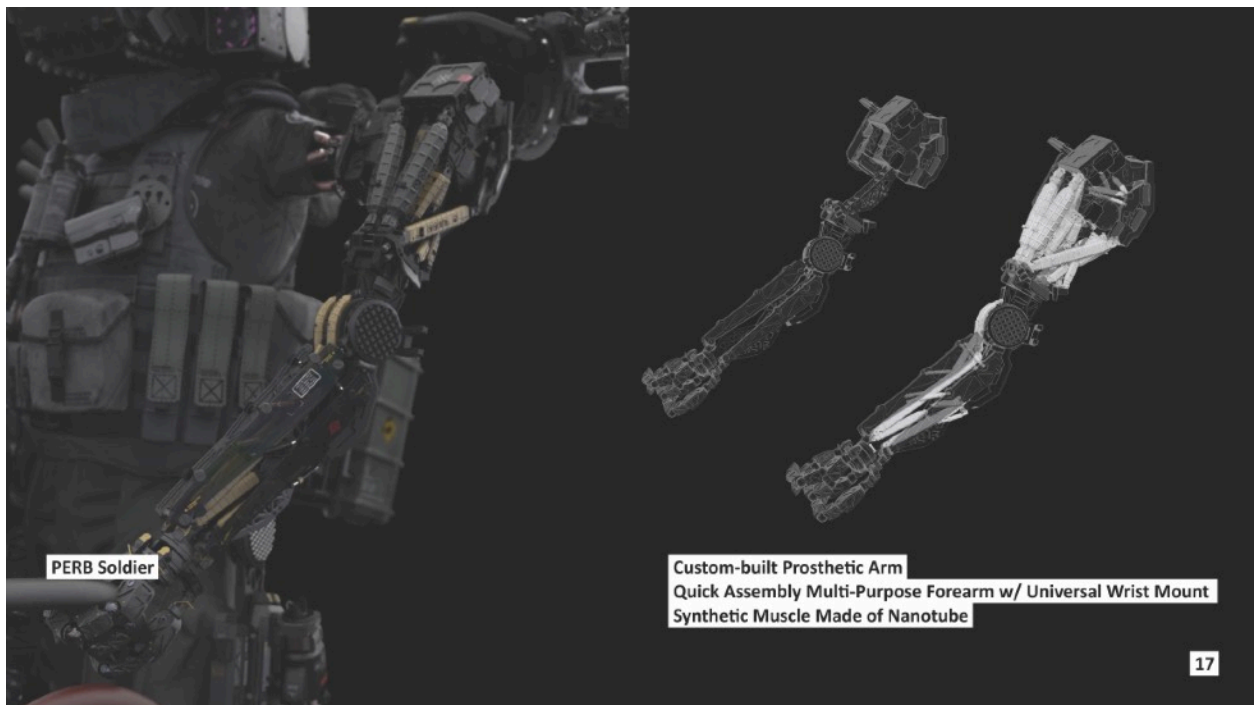
PERB Soldier

Custom-built Prosthetic Arm
Quick Assembly Multi-Purpose Forearm w/ Universal Wrist Mount
Synthetic Muscle Made of Nanotube

17

PERB Soldier

Custom-built Prosthetic Arm
Quick Assembly Multi-Purpose Forearm w/ Universal Wrist Mount
Synthetic Muscle Made of Nanotube

17

PERB Soldier

Quick Assembly Multi-Purpose Forearm w/ Universal Wrist Mount
Synthetic Muscle Nanotube
Self-Locking Hydraulic Spreader / Cutter

18
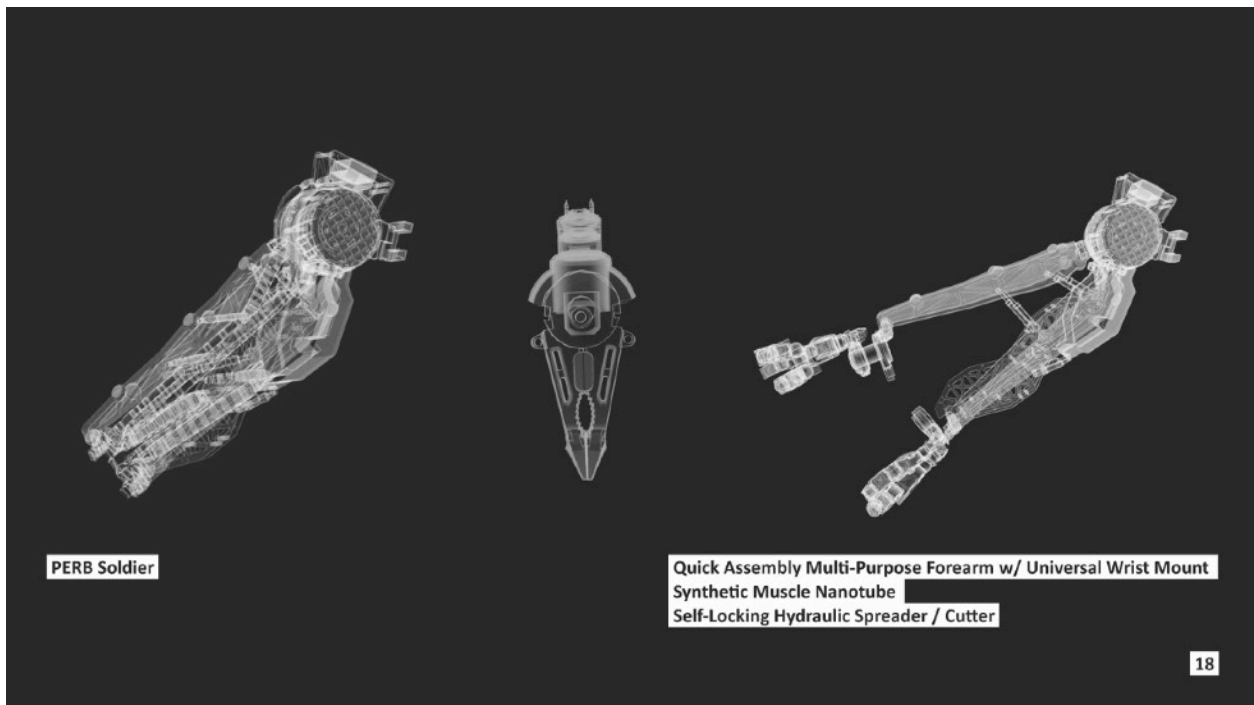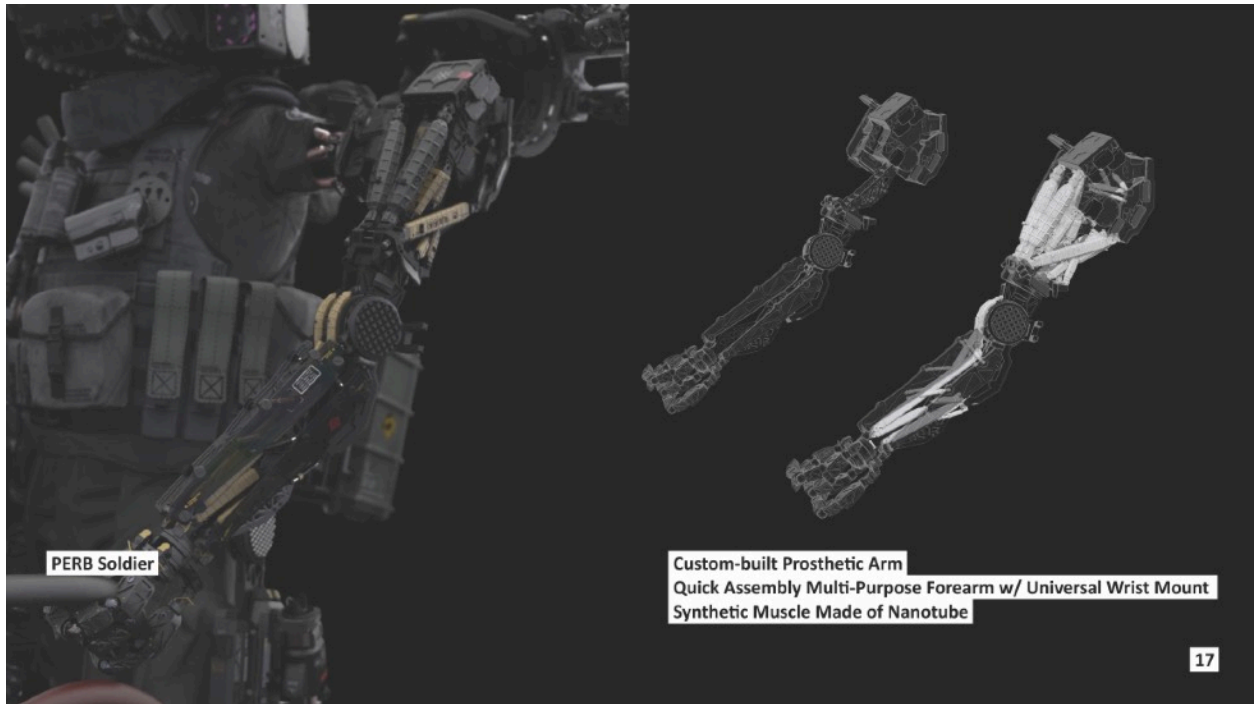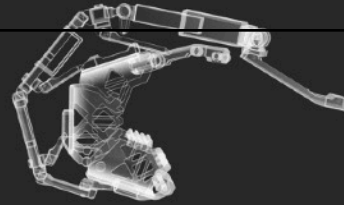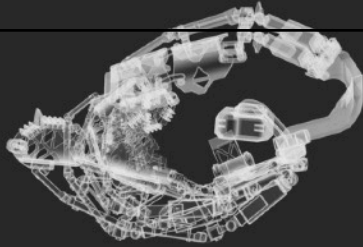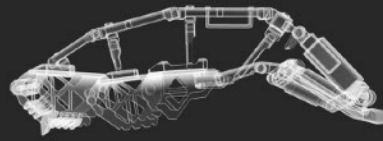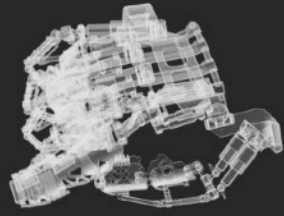
PERB Soldier
Exoskeleton Hand

Exoskeleton Figure Configuration

19
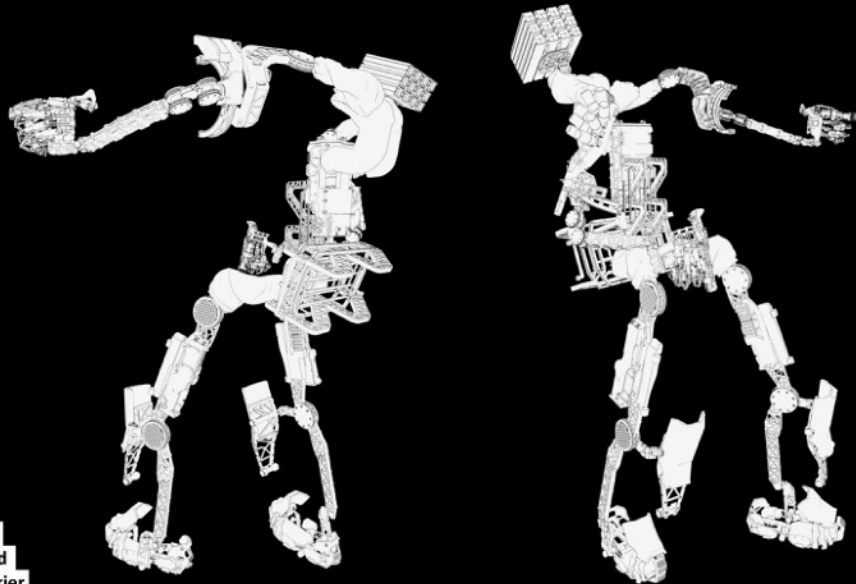
PERB Soldier
Modular Exoskeleton
8 Smoke Grenades Mounted
3*4 Homing Missile Mounted
Exo-Mount Frame Cargo Carrier

20

Thesis Proposal

School of Design
Rochester Institute of Technology
MFA Visual Communication Design

**Believable 3D Sci-fi Characters Design
Based on Substantive Materials**

Submitted by: **Kun Dong**
Date: 12-11-2013

Thesis Committee Approval:

Chief Adviser:

Marla Schweppe, Professor, Chair, School of Design

_____   _____

Signature   Date

Associate Adviser:

Shaun Foster, Associate Professor, School of Design

_____   _____

Signature   Date

Associate Adviser:

David Halbstein, Associate Professor, School of Design

_____   _____

Signature   Date

Abstract

Concept art can be created to achieve a wide variety of visual goals. Often science fiction means technology so advanced that there is no basis in reality. For my thesis I wish to create character designs that are inspired by existing technologies in regards to human prosthetics and augmentation. The existing technologies which will help inform my design decisions for two characters.

The background narrative to my character designs deal with the following design questions:

- How can the human soul be reflected through technology?
- How much existing technology can be fused or replace a human character's body and still keep the character human?
- At what point does a person stop being a person if their brain is detached from their body?

My design decisions will be made regarding the future of cybernetics. Cybernetics is a transdisciplinary approach for exploring regulatory systems, their structures, constraints, and possibilities. I want to experiment with character design to illustrate how technology can be used in human prosthetics and augmentation in the future. Can a society embrace aesthetics beyond the human form using technology?

The methods involved in the design process include: Digital Painting, Digital Sculpturing, Low and High-Poly Modeling, Image Compositing, etc.

Keywords: 3D Concept Art, Character Design, Digital Sculpturing, Hard Science Fiction

Problem Statement

Today, consoles and computers are so powerful that can achieve realistic graphics and provide believable immersion by using interactive device such as Oculus and motion sensors. With such a rapid improvement of technologies, the Character Design (Sci-fi genre), as one of the most important process of making a game or movie, were sometimes very subjective and empty.

I am trying to give a deeper thinking of Concept Art in my thesis, it will be detailed, religious, that can even be a possible origin/inspiration of other productions. I will design and model two 3D realistic characters for the science-fiction genre, which will largely based on technologies but fictional concepts. The background I created for my characters will also based on scientific materials and just serve my design as a tool. The design is need to be detailed, believable and fully functional.

Review of Literature

Subject matter:

1.

        Author: Michael Pedro
        Date of Publication: 9/4/2013
        Edition or Revision: 1st
        Publisher: Eat 3D
        Title of Journal: **Cyborg Design- Concept Art Production Techniques**
        Date of Access: 9/9/2013
        Intended Audience: Zbrush User, CG Artist, Concept Artist
        Objective View on My Research: Zbrush Modeling, Concept Art, Character Design
        Coverage: Part of the concept art: combine human body and machine together
        Evaluation: It will help me on both the technical and concept aspects

2.

        Author: Vadim Bakhlychev
        Date of Publication: 6/23/ 2009
        Edition or Revision: 1st
        Publisher: Vadim Bakhlychev
        Title of Journal: **The Making of Next-Gen Female Cyborg- Nox-2292**
        Date of Access: 6/2/2011
        Intended Audience: CG Lover, Concept Artist, Video Gamer
        Objective View on My Research: Game Modeling, 3D Texturing, Concept Art, Character Design
        Coverage: Concept Art, 3D Techniques Excerpt for Animation and Interaction
        Evaluation: It will help me on the Concept Art Part.

3.

        Author: Brett Sinclair, Furio Tedeschi Ted and Tiaan Franken
        Date of Publication: N/A
        Edition or Revision: N/A
        Publisher: Brett Sinclair, Furio Tedeschi Ted and Tiaan Franken
        Title of Journal: **The Dark Matter Project**
        Date of Access: 10/3/2012
        Intended Audience: CG Lover, Video Gamer, Concept Artists
        Objective View on My Research: Similar topic: Futuristic and realistic character design with animation (It is a project for film).
        Coverage: Most of the concept part, Character Design, Hi-poly Modeling and Animation
        Evaluation: It will be a goof reference of my thesis, but it is unfinished.

4.

       Author: Daniel Falconer
       Date of Publication: 12/29/2010
       Edition or Revision: 1st
       Publisher: Harper Design
       Title of Journal: **The Art of District 9: Weta Workshop**
       Date of Access: 10/8/2010
       Intended Audience: Film Fans, Concept Artist
       Objective View on My Research: It is a book about futuristic Mechanical Design, Weapon Design, Uniform Design and CharacterDesign
       Coverage: Concept Art, Concept to Product Workflow
       Evaluation: It will be a good example of a near- future world. All of the weapons, uniforms and vehicles in this book can be references.

5.

       Author: Mark Salisbury
       Date of Publication: 8/6/2013
       Edition or Revision: 1st
       Publisher: TriStar Pictures Industries
       Title of Journal: **Elysium: The Art of the Film**
       Date of Access: 9/9/2013
       Intended Audience: Film Fans, Concept Artists, VFXer
       Objective View on My Research: Mechanical Design, Character Design and some realistic equipments concept
       Coverage: Part of the Concept Art
       Evaluation: It will be a good reference for my exoskeleton design.

Technology:

1.

       Author: Mike Jensen
       Date of Publication: 2/23/2011
       Edition or Revision: 1st
       Publisher: Eat 3D
       Title of Journal: **Zbrush Hard Surface Techniques**
       Date of Access: 9/9/2013
       Intended Audience: CG Lover, Zbrush User, CG Artist
       Objective View on My Research: Zbrush Modeling,
       Coverage: 3D High–Poly Modeling
       Evaluation: It will teach me modeling and detailing techniques.

2.

       Author: Peter Minister
       Date of Publication: N/A
       Edition or Revision: 1st

Publisher: Digital-Tutors
Title of Journal: **Digital Tutors Creative Development: Building Futuristic Armor in ZBrush with Peter Minister**
Date of Access: 9/9/2013
Intended Audience: ZBrush User, Concept Artist
Objective View on My Research: ZBrush Modeling, Texturing, Lighting, Concept about Armor Design
Coverage: High- Poly Modeling, Texturing, Lighting
Evaluation: It will help me on finishing the modeling part.

3.

Author: Brad Groatman
Date of Publication: 9/1/2012
Edition or Revision: 1st
Publisher: Digital-Tutors
Title of Journal: **Modeling a Mech Robot in ZBrush**
Date of Access: 9/9/2013
Intended Audience: ZBrush User, Concept Artist
Objective View on My Research: Mechanical Design, Texturing and Lighting, Map Baking
Coverage: Lighting, Texturing, Hard Surface Modeling
Evaluation: It will help me with learning texturing and lighting in ZBrush.

4.

Author: Justin Marshall
Date of Publication: N/A
Edition or Revision: 1st
Publisher: Digital-Tutors
Title of Journal: **Modeling (and Texturing) a Female Hero in ZBrush and Maya**
Date of Access: 9/9/2013
Intended Audience: ZBrush User, Concept Artist, Maya User
Objective View on My Research: Human Face and Body Modeling, Human Posing, High- Poly Modeling, Hair Modeling
Coverage: Maya to ZBrush Work Flow, 3D Modeling of Human Figure
Evaluation: It will help me by refining my modeling work flow.

5.

Author: Justin Marshall
Date of Publication: N/A
Edition or Revision: 1st
Publisher: Digital-Tutors
Title of Journal: **Creating Game Characters with Maya and ZBrush**
Date of Access: 9/9/2013
Intended Audience: ZBrush User, Game Artist, Maya User

Objective View on My Research: A General Tutorial of Low- Poly Character Making: Human Face and Body Modeling, Texturing, Map Baking
Coverage: Maya to ZBrush Work Flow, Low- Poly Modeling for Game & Animation
Evaluation: Refining my modeling work flow, help me with learning low- poly modeling techniques.

Design

1.

Author: Kevin Muramatsu
Date of Publication: 10/18/2011
Edition or Revision: 3rd
Publisher: Krause Publications
Title of Journal: **The Gun Digest Book of Rimfire Rifles Assembly and Disassembly**
Date of Access: 9/9/2013
Intended Audience: Firearm Fans and Owner
Objective View on My Research: Knowledge of Real Weapons Structure and Usage
Coverage: None
Evaluation: It will be a good intro of how firearms work and how to maintain them, then I will have a better view of realistic weapon concept.

2.

Author: J. A. Parmentola, A. M. Rajendran, W. Bryzik, B. J. Walker, J. W. McCauley, J. Reifman, N. M. Nasrabadi
Date of Publication: 11/8/2007
Edition or Revision: 1st
Publisher: World Scientific Pub Co Inc
Title of Journal: **Transformational Science and Technology for the Current and Future Force: Proceedings of the 24th Us Army Science Conference (Selected Topics in Electronics and Systems)**
Date of Access: 9/9/2013
Intended Audience: Military Fans
Objective View on My Research: It is the most important resource I have find about real future military equipments and concepts, including new weapon, bullets, exoskeleton system, armor, military bots, etc, edited by US Army Research Office.
Coverage: Futuristic Weapon Equipments Concept
Evaluation: Great reference and theoretical base for my concept.

3.

Author: T. Bock, T. Linner and W. Ikeda
Date of Publication: 1/20/2012

Edition or Revision: 1st
Publisher: InTech
Title of Journal: **Exoskeleton and Humanoid Robotic Technology in Construction and Built Environment**
Date of Access: 9/9/2013
Intended Audience: Robotic Expert, Scientist, Human Interface, and Robotics Student
Objective View on My Research: The tendency and development of the robotic technology(exoskeleton) and human- machine communication.
Coverage: exoskeleton concept
Evaluation: It will offer me theoretical support about how a exoskeleton system work (animate them) and how they look (concept).

4.

Author: Patrick Lin, George Bekey, Keith Abney
Date of Publication: 12/20/2008
Edition or Revision: 1.0.9
Publisher: Ethics + Emerging Sciences Group
Title of Journal: **Autonomous Military Robotics**
Date of Access: 9/9/2013
Intended Audience: Department of the Navy, Office of Naval Research
Objective View on My Research: Military robotics, Future Scenarios about military robots
Coverage: concept of military robotics
Evaluation: It will help me make the concept of mechanical part.

5.

Author: J. Kenneth Edward
Date of Publication: 9/8/2012
Edition or Revision: 1st
Publisher: Osprey Publishing
Title of Journal: **US Marine Infantry Combat Uniforms and Equipment**
Date of Access: 9/9/2013
Intended Audience: Military Fans
Objective View on My Research: An Intro to Modern Military and Equipments
Coverage: None
Evaluation: Another great reference about realistic outfit, weapon, sign, and characters concept design.

Design Ideation

My research for my thesis will start with new/existing technologies. The purpose is not about doing industrial design but similar – create a visually realistic look to the design, and make characters more detailed, functional, scientific and religious. I will not bother by uncertain issues, for example, the Moore`s law will ends in ten years, the electronic world will be totally different after that. For this kind of problem I will take reference from believable predictions in the science field.

EXO–UL3 is a upper–limb exoskeleton, made by Bionics Lab., University of California, Santa Cruz. It is still a prototype. I use EXO-UL3 as a reference for joint design.

An exoskeleton system usually has more complicated joints than human limbs. The system is assigned to the human joints as flexion-extension, and moves along the bones of the human limbs. My design has nine single-axis revolution joints. The positive rotation around each joint produces the following motions: flexion–extension, 90 degrees and 180 degrees rotation, radial–ulnar deviation, abduction–adduction, internal– external rotation, pronation–supination, etc. I will show the design in my sketch.

Firstly I will make detailed sketches, than model it in maya and finish modeling in ZBrush. After the modeling done I will make a image based lighting for it in ZBrush. Tired, render the model in ZBrush, texturing in Keyshot or Photoshop, and finally composite it with photo background in Photoshop. The final project will be two images for each character, and a 5 min turntable animation showing details and overall design.

I created a narrative background for my characters.There will be two different sci-fi characters set in the near future. The sci-fi backstory that I will be using deals with humans becoming more machine-like. In the future, humans find a way to copy their consciousness and memories into the computer to achieve immortality. As a result, the human race is facing several serious questions about civilization:

   •How can symbolism of soul be reflected in technology?
   •At what point does a person stop being a person if their brain is detached from their body?

Andrew Rollings and Ernest Adams suggested character design in two ways: through art–sourced design or through story–sourced design (citation). The character design in my thesis is art–sourced. The appearance of my characters are decided upon first, and then a background story is fleshed out to augment it.

There is a movie called Catch Me If You Can, directed by Steven Spielberg, 2002. I used this movie as a source of inspiration for my story's plot for these two characters. In the movie, an FBI agent hunts down a young con artist who successfully impersonated

an airline pilot, doctor, and assistant attorney, cashing more than $2.5 million in fake checks in 26 countries.

My story is set in the future world where a scientist transferred his consciousness into a computer and left no trace. People believed he has died. Actually he uploaded himself into a satellite and keep himself alive and ever-evolving. After years, a missile-like small device came to earth without any notice, this is the Man Machine, Character B. It is hiding in a junk yard which filled up with electronic garbage.

Character B's first appearance is that of a spider-like small device. It forms is body, and he keeps improving it by collecting parts from the junkyard. After a couple of years, he brings a massage to the humans that a revolution is coming; humans can have unlimited life, memory, energy, and knowledge.

My concept here is a new human (creature) form with no physical existence. The character appeared in the physical world is for brining a massage; it is not a necessary condition for him to have a body (to keep him alive). This character has three bodies at the same time, one is a human-shaped robotic body, the second one is a small aircraft (an remote-controlled device, no direct connections), the third one is a satellite, out of the planet.

He also has different personalities. Sometimes they are vague or more like a combination. He is a man and several (duplicated) men, which explained why he has several bodies and more limbs. Some concepts will not been revealed in my final images but I will make all the sketched and notes about them.

After Character B has made himself known to the public, the government wants his knowledge, technologies, and power. The government also tells the public that this is a cult, and he is not a human. So they formed a task force to try and catch him. One soldier in this task force will be the Machine Man, Character A. Character A is a special agent, like the agent in the movie. He always fails to catch Character B because B knows everything. And they have conversations such as an argument about the definition of a human being.

The current design is a robot 'faquir' wearing clothes, neck scarf and a mask. He wears the mask while appearing in public, or talking to strangers. With the mask on you can not tell it is a 'man' or not. The mask itself is a symbol of him. I will design a modular hard-shell jacket, a vest and a backpack for him.

He has a human-shape robotic body, four hands, his head is a sensor integration and small rocket launcher with armor pieces attaching on it. He is carrying a distant controlled robot with him in his backpack, wearing human clothes and other accessories. He has two pairs of arms, one hides in his jacket. He has an ancient mask and wears it sometimes. I am thinking about a Lamanism (Tibetan Buddhism) mask, in the sketch the mask is the Angry Lord (Hayagriva), in Chinese it is called the Guardian with Horse-Crown or Leonine Dauntless Avalokitesvara, a symbol of sacrifice and

justice. This character has four different symbolic pattern and sculptures on his four different arms.

The basic concept is from a work I made several years ago and the Four-Armed Avalokitesvara. Avalokitesvara is not a god in traditional Buddhism, it is an enlightenment being without sex genre, like this character "he" is a life form without gene, a new human have no needing of reproduction, it can duplicate and improve itself on high performance computers.

Sketches

Figure1
Research and reference
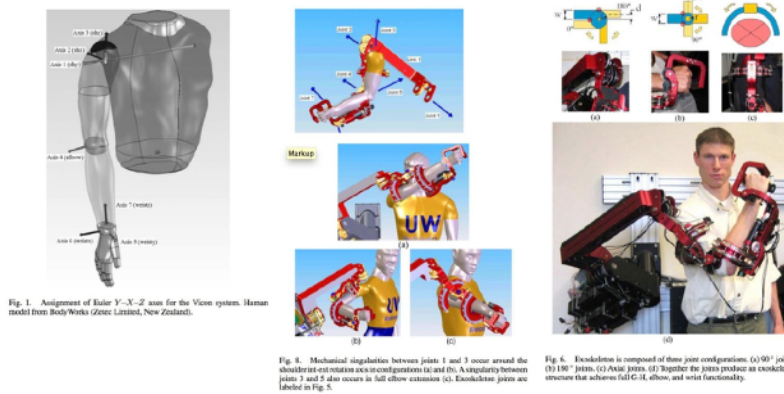
Upper-Limb Powered Exoskeleton Design   EXO–UL3

Bionics Lab., University of California, Santa Cruz

Joel C. Perry, Jacob Rosen, *Member, IEEE*, and Stephen Burns

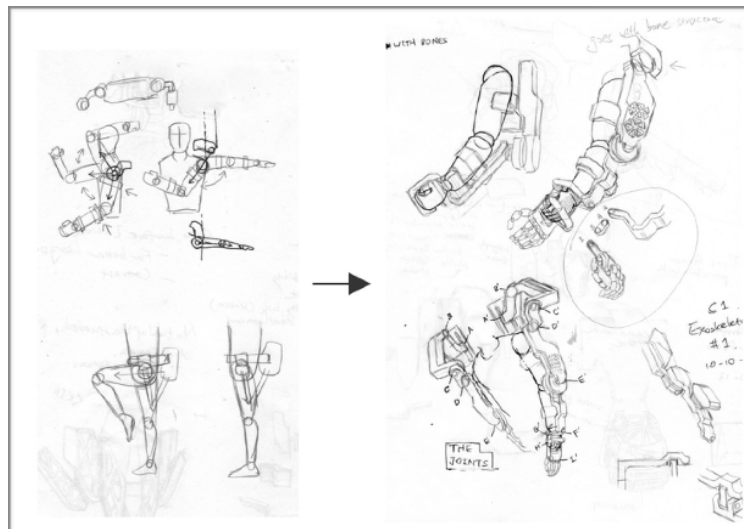Figure2
A design of exoskeleton system
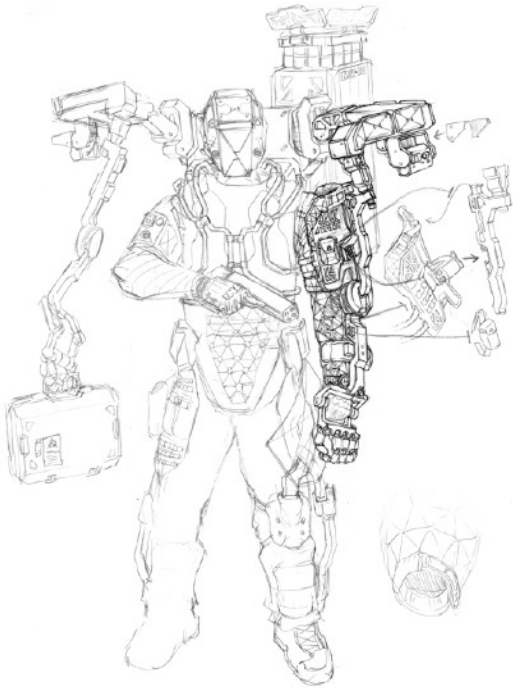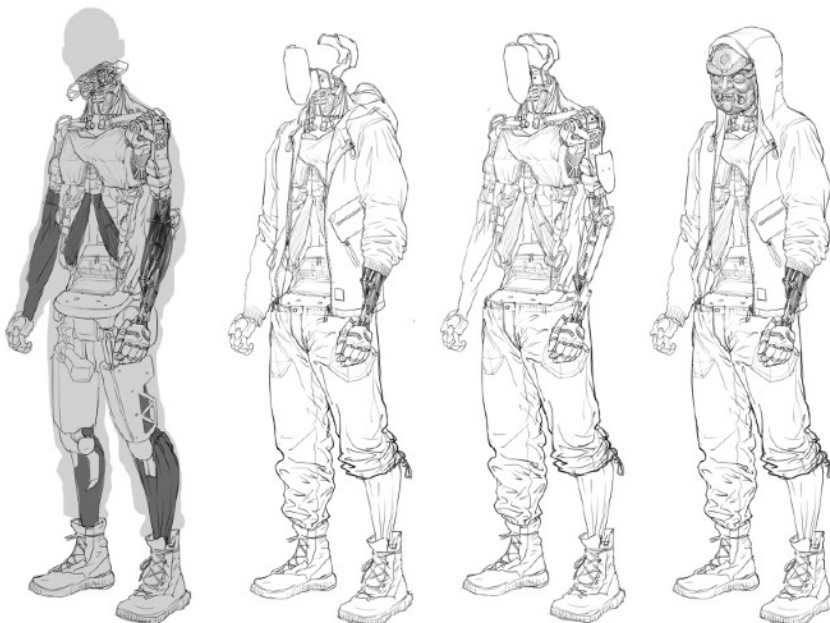
Figure 3
A sketch of 'character A

Figure 4
'Character B', wearing a casual cloth (with a mask).
Methodological Design

The planning workflow:

1. Drawing: Doing my research, reading articles, making sketches on paper, collecting inspiration and references;

2. Digital Painting: Finishing the character design in Photoshop, start to thinking about texturing, lighting and posing in 3D environment;

3. Modeling start with Maya: Simple modeling, part of hard-surface modeling in Maya;

4. High-poly Modeling and Digital Sculpturing: Maya high-poly modeling of a human face and body figure; All 3D models will be detailed in ZBrush,;

5. 3D models turntable animation done in ZBrush, part of texturing and UV done in ZBrush;

6. Map-baking and Low-poly Modeling: All subdivisions models goes back to Maya with UVs and textures, texturing done in Ddo, Photoshop, and ZBrush;

7. Taking photos for digital compositing, making HDR image for reflection and image based lighting;

8. Rendering images in ZBrush, Maya or KeyShot;

10. Compositing and detailing in Photoshop, 4 images for characters, 2 images for props;

11. Making turn table animations in Zbrush and Maya;

12. Making video composition video in After Effects.

Software will be used in this project: Maya, ZBrush, Photoshop, After Effects
Software may be used in this project: KeyShot, HDRshop, Ddo

Deliverables

18*11" still images.
two images for each characters, two more images for specifications.

1920p HD Video
3-5 different turntable animations for 3D models with diagram explain, and final images in one composition video, total length about 3 minutes.

Implementation Strategies

For me, personally, I am addressing a challenge by doing research about modern science, 3D modeling, motion, animation and digital composition in one project. This project will be a demonstration of everything I have learned in RIT and in the past.

I have the needed techniques about 3D modeling and sculpturing, but do not have a lot of training about low-poly modeling and texturing. I want to focus on 3D modeling and Concept Art, they are my interests and most of my work about.

Dissemination

HD videos on Youtube and Vimeo
A website/blog/facebook page about the design, research, images and videos
Six 11*18" prints

Evaluation Plan

I am going to make several topics about my thesis in different main-stream CG and concept art forums. And collect all kinds of critiques and feedbacks from professional/ amateur level audience.

Questionnaire survey for teachers and students from both Industrial and Visual Communication Major.

I will place my critiques into different categories, and evaluate them, find out what is the biggest problem and try to correct it without deviate from my design ideation.

Pragmatic Considerations

Software: ZBrush 4R6, Keyshot, Fusion
Tutorials and Books

Bibliography

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