BIOMEDICAL MECHATRONICS

DESIGNING FOR SPECIFIC BIOMEDIAL NEEDS

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INFORMATION
SOFTWARE
TECHNOLOGY
TERM 3

Table of Contents

Statement of Intent - 3

Evaluation of existing ideas - 4

Empathy map - 6

Communication logs - 7

Logic Flow Chart - 8

Pseudocode - 9

Pictorial - 10

Statement of Intent

I intend to make an arm attachment for David which will help him move chess pieces easily on the board without it being hard for David to grip or pick up the pieces. The arm attachment will also help him to prevent accidentally knocking other pieces on the board over when he wants to pick up a piece.

The arm attachment will include 3 fingers (these fingers being the thumb, index and middle finger) and will have sensors which detect the different colour pieces on the board, and the colour of the squares on the board itself. I have decided to only use three fingers of a hand for this arm attachment as most people when playing chess only use those three fingers to grab pieces as it is more efficient and avoids collision with surrounding pieces.

The arm attachment will also contain a switch which when flicked will change if the attachment closes when it detects black or white. Once it is detected, it will close onto the piece for 3 seconds before releasing again,

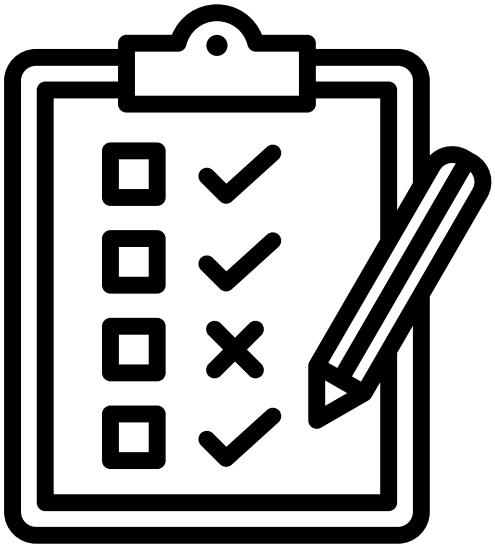
When David uses the arm attachment which I have made for him, he will be able to use the arm attachment in order to pick up the pieces with ease and place them precisely on the board without knocking over other pieces. The arm attachment will allow David to fulfil his dream of being a chess master.

Evaluation of existing ideas

Existing Idea	Evaluation
	I like the design of the hand and how it is almost an exact replica of a human hand. Though it may be a good idea to have a full hand rather than three fingers, I still would prefer to make a three fingered arm attachment as it would better suit David's needs as he says normal prosthetics are too clunky when moving pieces and he wants a more sport specific prosthetic. The design seems bulky and the fingers are quite chubby, so I think there is not much I can take inspiration from in this design.
	The slim fingers of the hand are great and would suit David's needs of the prosthetic not being bulky. The carbon fibre palms are also really good as they make the hand light but strong, which is something I could put into my own design. The water resistant feature is great as it can protect the hand from damage if it does come into light contact with water. The fast charging speed is also a well thought part of the hand as this is something you would want to charge quickly. The design is very good overall and there are things I could from this design I could incorporate into my own.

Evaluation of existing ideas

Existing Idea	Evaluation
	The hand being realistic is a great feature in this design. The fingers are yet again slim like the previous model. The hand would suit the needs of David, though I don't like the way the thumb was built on the hand. It appears as though it cannot move like a normal human thumb would. Apart from the realistic design, there is not much that I am able to take as inspiration for my own design. Overall the hand is a good design but there is not much to take from it.



Empathy Map

SAYS

"I often find it challenging to grab chess pieces and place them gently on the board."

"A specialist nurse taught me chess as a way of learning to use my prosthetics while I was in hospital after a car accident."

"I have discovered that my normal prosthetics are too clunky when moving pieces."

THINKS

"I have discovered that my normal prosthetics are too clunky when moving pieces."

"What I need is a sports-specific prosthetic so I can full fill my dream of being a chess master!"

David

DOES

David uses his normal prosthetics to get the job done however it doesn't get it done well as his current prosthetic is too clunky when moving pieces.

FEELS

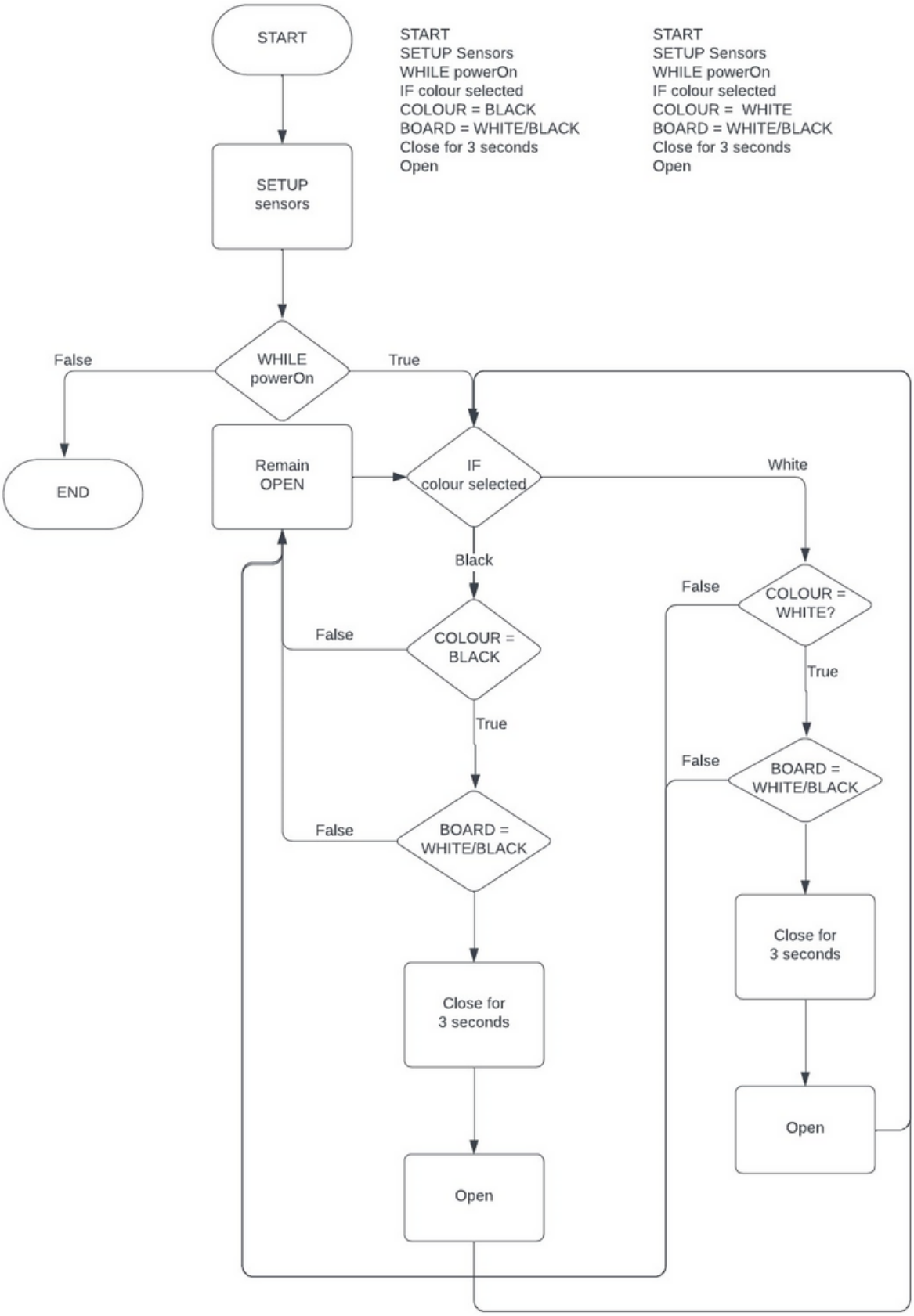
David feels good when winning chess games.

David feels annoyed that the prosthetic he is currently using is too clunky when moving pieces.

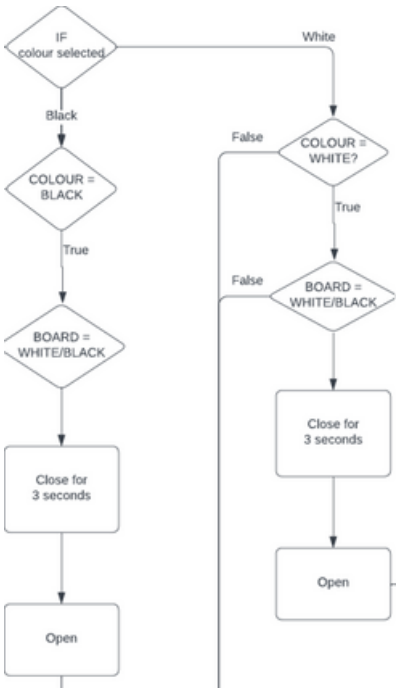
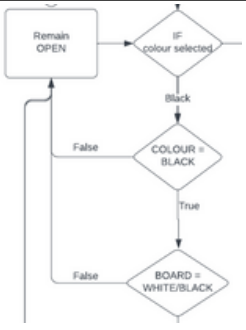
Communication logs

Person contacted	Date Contacted	Question Asked	Response
David	7/9/23	When you were using your old prosthetics, did you have a preference of which prosthetic you preferred to use more?	When I used my old prosthetics, I preferred using my right one over my left one.
David	10/9/23	Would you prefer having an actual hand or would you rather an arm attachment which is more like a claw?	I don't mind, I can work with either one as long as it isn't too bulky!
Referring Specialist	15/9/23	Should I make one or two prototype models of the arm attachment?	Just one for now as this is just a prototype.
David	17/9/23	How did you grab chess pieces with your old prosthetics?	I grabbed the pieces using my thumb, index and middle finger.
Referring Specialist	20/9/23	Where are David's amputations?	• Mid-section trans-radial amputations of the left arm • Mid-section rans-radial amputations of the right arm

Logic Flow Chart



Pseudocode

Operation	Flowchart Example	Pseudocode Example
Start up and setup sensors		START IF powerOn = False END IF powerOn = True Select Colour
Opening and closing of hand		IF Colour = BLACK = TRUE BOARD = WHITE/BLACK = TRUE CLOSE FOR 3 SECONDS OPEN IF Colour = WHITE = TRUE BOARD = WHITE/BLACK = TRUE CLOSE FOR 3 SECONDS OPEN
False detection of colour		IF Colour = BLACK = FALSE Remain OPEN IF Board = WHITE/BLACK = FALSE REMAIN OPEN

Concept Pictorial