

# Battleship



## Phseven Games

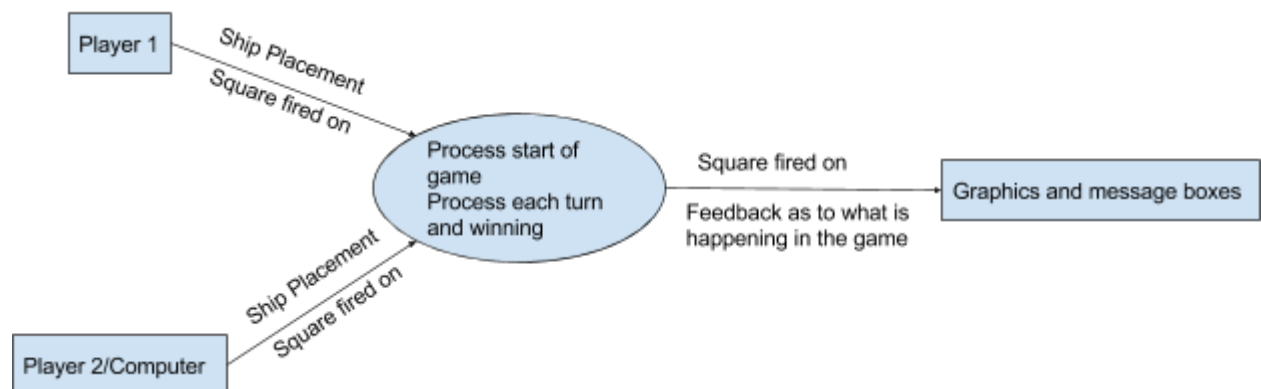
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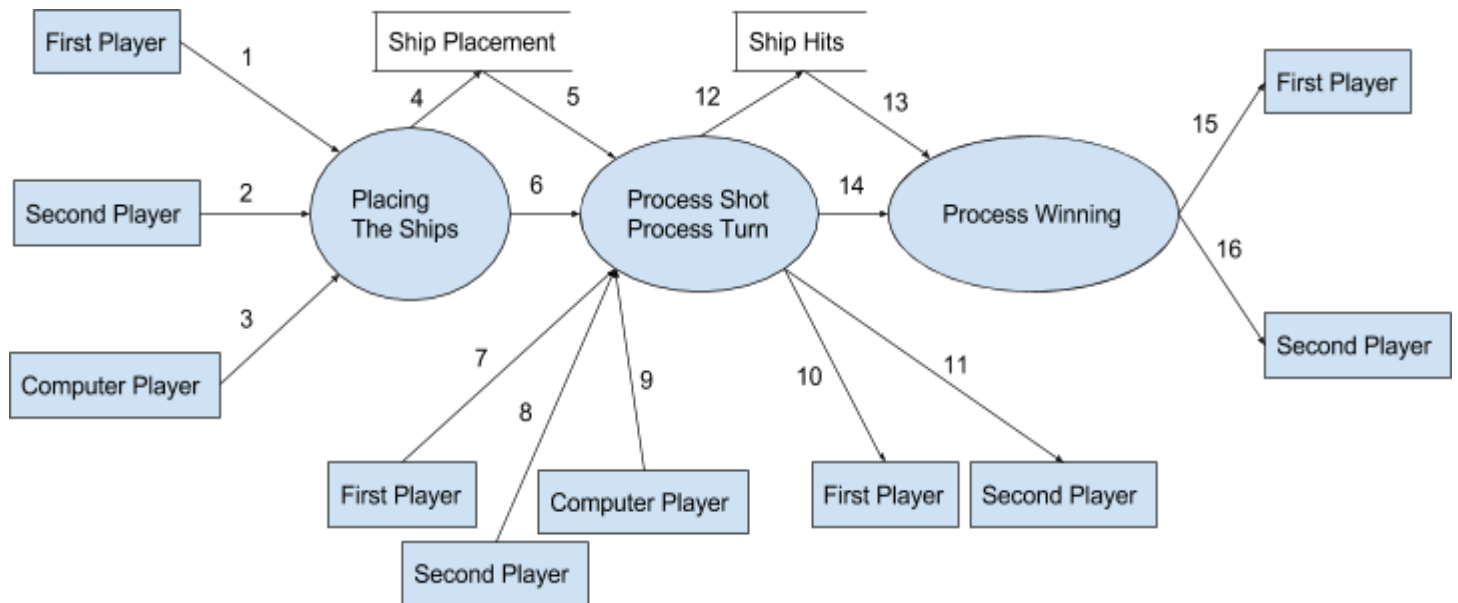
# IPO Chart

Input	Process	Output
Whether a two player game or single player game is selected	Decide whether a single player game or two player game is selected and make changes for ship placement accordingly. Also decide whether the computer player will be used	Message boxes indicating what needs to be done to continue playing the game
Placement of ships	Puts ships into arrays	Ship placement graphics
Squares that wished to be fired upon	Compare whether a square has a ship in it	Whether a ship has been hit or not and graphics representing that

# Context Diagram



# Data Flow Diagram



1. Location of player 1's ships, type of game
2. Location of player 2's ships
3. Location of computer's ships
4. Location of ships
5. Location of ships
6. Type of game
7. Position of shot
8. Position of shot
9. Position of shot
10. Graphics, hit/miss
11. Graphics, hit/miss
12. Amount of ship hits
13. Amount of ships fully hit, ie sunk
14. Have sunk all ships
15. Tells player who won
16. Tells player who won

# Log Book

29/1/2016 - Received major project and created hierarchy structure as well as empty documents to be filled out

30/1/2016- Created grid of buttons to resemble squares on the battleship board, name them correctly (took ages) and set default states of the buttons to be disabled and Player 2's grid to be invisible and removed text from the buttons

Replaced buttons with a picture box design for reasons of clicking on them and another image showing up which would be seen if a hit/miss occurs

Had idea of how to do 2 player battleship, black out one player's screen as the other is making a move and they are switching over seats

Created other picture boxes to represent ships and was creating "click and drop" functionality so the user can select where to put their ships, although encountering late bound errors and googling the issue has been of little help

31/01/2016 - Created reset button so users can repeatedly play the game without having to reopen the program. Added in click and move around for the boats and took a while to figure out how to do so encountering issues of needing multiple byvals to do it all in the same sub, which didn't work. Created confirm boat placement button and added functionality difference between CPU and 2 player mode.

Corrected clicking on grid points to be the correct number in the array. Have issue where all boats that would normally be on the left side get hit on the right, going to rewrite that function. Have to set up a lot of senders. Turns are set up properly so boats on the other side are turned invisible when it is switching over time and when it's the opposite sides turn

3/2/2016 - Started working on data dictionary and gantt chart putting basics in as they are done

9/2/2016 - Corrected hitting and now hitting works in totality. Started on computer player and added in random hitting until a hit has been made although its broken

10/2/2016 - Fixed issue where computer would fire in patterns on which side was hit first when randomly picking something in the follow hit function.

16/2/2016 - Fixed issue where random wasnt random

18/2/2016 - Created logo and title page for all documents to go into

24/02/2016 - Made the computer be able to place ships all-be-it ships were placed outside of the grid causing it to crash and ships could be placed on top of each other, but it kinda works

James Halley

25/02/2016 - Computer can place ships, although not entirely random, gameplay should be unaffected unless source code was viewed. When the computer enters its ships into the array, the medium boats seem to not be adding in correctly and adding an extra block onto the ship that should not exist.

Turned out to be nothing more than incorrectly putting in numbers, ie logic error

2/3/16 - Worked on smaller issues in the code including renaming of some objects that were misnamed initially

8/3/16 - Worked on organising log book and ensuring all entries were together

15/3/16 - Encountered issue with rotation where grid spaces would seem to have a ship in them when they really didn't presumably issue with recalling the placement array

22/3/16 - Experimented with issue of the rotation and changing sender and just reverted back changes that were made to it

27/3/16 - Created IPO Chart and started context diagram although they could both be improved

31/3/16 - Refined both context diagram and IPO chart to convey the information more efficiently and be within the marking guidelines as well as the course specifications

7/4/16 - Refining shooting logic and coming up with possibly better equation to use to figure out the grid space of where the user has fired

13/4/16 - Intrinsic documentation in the form of comments added to a few things

19/4/16 - Went back to project after exams and took away function that seemed to make the computer ship placement not work properly and made a longer way to do it but might be able to be made more efficiently later. Oh wow, I got rotation working by using the scroll wheel instead of clicking on it as that was the issue of it putting it into the array and stuffing things up generally

Fixed issue with ships being able to go outside grid with use of tags although I tried a variable which was just generally a terrible idea.

Note to self, 1:30am coding is extremely productive

To do definitely still - Ships on top of one another and firing on the same spot

Maybe do - Make the menu, 1 player and 2 player all different forms as to clean up although this would mean replicating code therefore making the file bigger, but load time less

24/4/2016

Put single player and 2 player in separate forms which fixes the reset issue i had before.

Started work on the on top of error detection and works when the ship sizes were fixed although doesn't work if you pick up the one from underneath the original one that got put on top

James Halley

Following sides is as troublesome as always and i saw it not follow the bottom side correctly again and the select case at the very bottom is still just not appearing to be going through it, no clue what to do for that

I've only done these changes in single player for the minute as to get them working in that first then move them to 2 player

Case logic is just ghastly although having an if statement inside it seems to work fine

The bottom follow hit thing gets stuck in a while loop it seems, turns out it just gets stuck as it seems the side when going off the grid isn't getting entered into the thing properly maybe possibly the reusesidescount isn't getting to 4

Outside tag doesn't work anymore possibly due to resizing of the ships and mousing over height and width during debugging, it looks really wrong

27/4/2016

Made it so then outside and on top of can be detected by using tags and after much bug searching, it works

Started brainstorming ideas of how to fix the fact that the computer when following a side or choosing another side, will fire on an already shot at square

Put the ship placement from 1 player to 2 player and had a slight logic error and fixed it

28/4/2016 - Had a meeting to ensure progress was being made, sorted out issue that seemed to relate to using professional or express version of visual basic. This was solved by finding out that the program would be tested on express so hopefully it should work. Issue where the computer would rarely place the 3 size ships on top of one another by changing the base of where it can start to be random

Found issue while testing on will's laptop that random squares could be hit and would register when they definitely shouldn't, also found issue that occasionally when firing, it originally registers as a miss although when shot at again will register as a hit. No clue whatsoever what causes this.

BoatNum 3 in the middle bit failed in the middle square

Created images to use for the ships and created rotated counterparts for them

Found a website as to how to actually switch the images and it does work although it relies on not running the program on anything but the d drive and can't be put inside another folder as that is how the pictures are found

In other words, I haven't found a way to use relative position of the program to access the resources.

Found major issues yet again with ship placement and they aren't where they are supposed to be and this was found out by the ships producing error messages when they shouldn't have, possibly by not resetting the rotation variable when a new ship is picked up

That was probably a problem, although it didn't fix what I wanted to fix, still seems to be setting array values to be 1 that aren't supposed to be

It might have worked because I tested the wrong form....

Nevermind still broken

Issue definitely seems to be something with rotation although I can't figure out what the issue is now

29/4/2016

James Halley

Added in help form with link to real rules of battleship. Used older project to know how to do it and made it so when the menu is closed the help form is too as that was an issue.

Added in message boxes so as to figure out what was causing the random hits that seemed to be taking place. The click position that gets passed to test in the array doesn't work as expected and sometimes when clicking on a square it would test what it thought was the correct spot in the array although the clickposx and clickposy were giving it the wrong values to test.

Had issue with picture not changing when rotating back but that was just an issue with using the width of the boat rather than the height of the boat, a copy and pasting error

To do still for the project:

make it so when the computer is following a side and it reaches a miss or something that's already hit, just mark that side off as bad and if there is leftover time, make it so when there's a hit it tries to skip over it but that's extra

Sinking a ship

Winning the game

Click position fix

Click position fix maybe: I changed the code that was being used to determine the border size and the title bar height as the only time things were getting the wrong squares were in the y direction and the code used was not built in functions to get these values.

That was not the issue, although I changed the way that the user's click position is determined, instead of using the actual position on the screen for the mouse, I now use the grids individual position to determine the mouse's position. I have to desk check for boundaries although I think this will work

Did a desk check and it should work as expected although there is probably testing that needs to happen

It looks like it has worked and it now giving another logic error where the ship seems to be placing both directions when rotated

Problem is it would clear the squares it is rather than where it was and the reason it still looked like it was normal is because it was placing them down after taking them away.

After much swearing and troubleshooting, it appeared I needed to reset the global rotation variable before trying to rotate the ship, hints towards this conclusion were seen when rotating the ships sometimes cause the images to not work correctly, leading me down the correct road.

After a few minutes testing this appears to work flawlessly so let's hope it stays that way

After more testing found that there are still issues with it, added in checks at the start of each part of code that deals with ship placement to check whether it is rotated or not

AND IT STILL DOESN'T WORK

Deleted all the checking if rotated work and going to come back to it later

2/5/2016

9/5/2016

Changed the code so then it is when the confirm button is clicked that the ships are put into the array. This wasn't possible as before I wasn't aware of the collection object in vb. This

James Halley

means that the previous issues of rotation not placing correctly and all that jazz is fixed. Although once done having an overflow issue although not sure why. Issue may have been with the fact that boatlocx and y were not being redefined when going in between the two players (issue was on 2 player)

Followside in the computer player still has the issue when following a side and if it follows it off the grid, it will be stuck in a while loop, although it did work once when going up the top but didn't before. It broke when it had no sides left and follow side was still on and it chose the left side. Seems to be an issue with an incorrect side at the grid not being entered into the not reuseside array correctly

Added in winning condition to 2 player as single player is tougher because there isn't a second set of boats technically on the grid, will probably be difficult to find a way around this that isn't placing the boats there which might prove to be the best thing to do.

Added in sinking so that when the picture box you selected overlaps with a ship you hit that ship. Unfortunately, there is overlap so it will "hit" the correct ship and if a ship is placed right beside another it will overlap onto that one as well. Don't really know how i'm going to overcome this possibly through use of rectangle objects rather than just bounds although the bounds is what makes the rest of it possible.

Attempted to use the sender property to see if that would work while the object is invisible, unfortunately it doesn't send while invisible even when clicked on

Figured out a possible solution by using the position of the mouse to see whether it in 'inside' of one of the boats when it's clicked, although the logic of and is not always obvious in vb and it appears not to work when it should.

With the single player sinking detection on the computer, trying to see if an array filled with the types of ship and then using a select case to add the correct one to the correct position in the current hit array

This does not appear to be working and is getting an overflow error it seems that there is an issue in between when it is placed in the positions array and the type array

10/5/16

Made change to if statement concerning whether the mouse position was "inside" the ship and it was a logic error as a greater than and less than symbol needed to be swapped

Issue with sinking for the computer player as it would register properly and ended up being that the ships were not corresponding to their max hits correctly

Tried to fix issue when it is the last side and the ship will fire outside the grid it causes it to be stuck in the pick a random side that hasn't been used loop. This may have been fixed by properly resetting after the ReUseSidesCount has reached 4. THAT FIXED IT HALLELUJAH!

Found issue where it crashed while trying to reset as if the code was still running although the form technically was closed

To do list: Make it so then the computer will not fire on a side where there has already been a miss

Make it so if following a side the computer will try to skip over a previous hit

Computer sinking the player's ships and/or computer win condition

James Halley



Attempting to try and make the jump hitting over a space that has already been hit such as would be used if 3 ships are next to each other and they manage to sink the middle without sinking the other two

Didn't work

Having issue where the side's seem to be getting put into the reusesides array when they shouldn't be which is probably overuse of the change sides function. Going to take quite a while to find it and will probably do it after some documentation has been completed.

13/5/16

After trying to muck around with the check outside and illegal sides, I had epiphany as to what to do to make it work. If i were to stop the running of the followhit sub if there is an illegal side detected then it re runs the followhit sub.

16/5/16

Cleaned up position of modules of the computer player in the source code and made a change where when the computer gets a hit it searches around that space for illegal places rather than finding them randomly. Also the computer does a search after it fires if the space it is about to shoot at is invalid. This seems to have worked and now the computer will no longer try and fire off the grid. It encounters an issue now where the sides are being put into the reusesides array and only happens when it is with the jumphit module. This may also be an issue caused by the seeing if the side about to be fired at is illegal

18/5/16

Put already existing data dictionary into a table on google docs and cleaned up some variables that were used earlier and were no longer being used such as correctside.

Observed that jump hit isn't working when actually trying to jump over a hit. ReUseSidesCount is somehow getting to 4 without it resetting itself let alone the fact it's getting to 4 in the first place without changing sides so maybe changing sides is being called multiple times so then it can't reset itself before another one makes it 4

Also got rid of the variable path as it was not being used anymore and was replaced with the resource manage built into vb

Decided to work solely on documentation until it is finished so then marks are maximised rather than spending lots of time picking up few marks extra.

In reference to the jump hit issue, a system flowchart would probably need to be created as to see how the computer firing works as where it changes sides can be improved

Issue where if the ship is trying to follow the side, it can fire on a space that has already been fired on also an issue with the computer actually winning the game as it appears to not have worked

19/5/16

Checked with sir in relation to what had to be done referring to documentation as I was unclear as to what to do for it, although now I know that a button in the game that links to a google doc will work fine. Creation of this documentation has been moved over to the doc.

James Halley



Also when it is on it's last side and following a sequence it will get stuck possibly because it's not trying to go back to random firing.

23/5/16

Issues that currently exist and probably won't be fixed

- When ships are near the border the computer will see the border as a non viable space and change sides. This is only the case if it follows it in there because it can follow along a border but not cross into it, because it's testing the next spot to make sure it doesn't try and fire off the border it cannot be fixed and still have what i have work and would require much more time

25/5/16

Fixed issue where the computer would get stuck in a while loop if it was the last side and it tried to enter the border of the grid. This was done by putting in an if statement around the goto as it would have always changed sides when it is at 4 sides used although, it had no option to end after that.

Changed code to use vb built in feature of += 1 rather than  $x = x + 1$

Also removed sunk arrays from 1 player as they are not needed with the cheat of adding 1 more to the current hits

Changed order of some lines that may help improve continuity in the program such as changing the background colour of the ship that was placed with an error before the message box appears

26/5/16

Discovered what causes issues and started to create a basic system flowchart as to what it would need to be to actually work and there would be far more code and I do not have the proper knowledge of how to do it.

Look on next page

Put all things together in the one document prepared for printing and a final look over

30/5/16

Added in game timer as marking criteria said timer and tried to use more graphics by adding an explosion graphic when there is a hit. After looking at trying to make computer sinking ships work, discovered it was using an X when it should be using a Y

Added in graphics and had issue with gradient and then realised the box couldn't move 0.4 of a pixel so made it in groups of 5 to kinda cheat but it looks reasonable, also added in cannon sound so then it's obvious it's shooting

James Halley

The flowchart describes a pathfinding algorithm for a robot in a corridor. It starts with a box labeled "Pick Side". A decision diamond asks "If about to move out of border". If "True", it leads to a box "Change Side". If "False", it leads to another decision diamond "If changed sides < 3". If "True", it leads to a third decision diamond "If can't side". If "True", it loops back to "Pick Side". If "False", it leads to a box "+1 to position based on side". This is followed by a decision diamond "If about to move out of sf". If "True", it leads to a box "Change Side". If "False", it leads to a final decision diamond "If square already hit". If "True", it loops back to "+1 to position based on side". If "False", it leads to the "I give up" box.

```

graph TD
    Start([Start]) --> PickSide[Pick Side]
    PickSide --> Border{If about to move out of border}
    Border -- True --> ChangeSide1[Change Side]
    ChangeSide1 --> PickSide
    Border -- False --> Sides{If changed sides < 3}
    Sides -- True --> CantSide{If can't side}
    CantSide -- True --> PickSide
    CantSide -- False --> PosInc["+1 to position based on side"]
    PosInc --> BorderOut{If about to move out of sf}
    BorderOut -- True --> ChangeSide2[Change Side]
    ChangeSide2 --> PosInc
    BorderOut -- False --> Hit{If square already hit}
    Hit -- True --> PosInc
    Hit -- False --> GiveUp([I give up])
  
```

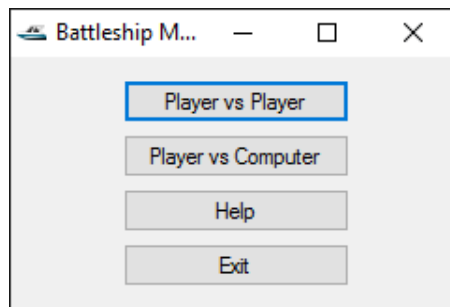
Hand-drawn diagram of a corridor with a robot at the bottom left. The corridor has a top wall and a bottom wall. The robot is represented by a small circle with a dot in the center. The corridor is divided into sections by vertical lines. The robot is currently in the first section from the left.

- The CPU player portion of the program worked when it didn't try to jump over already hit spaces and just try a different side like it would a miss although this seemed to be an important addition and even if it didn't always work 100% it was better than nothing
- The way to fix the issue relating to this would be far beyond my own skill level and suggested solution said to read a textbook on artificial intelligence first which is where i drew the line.

# Help Documentation

## Welcome to Battleship Help

To play the game, select which game mode you would like to play from the menu. The menu is shown below



To play with another human player locally, click "Player vs Player"

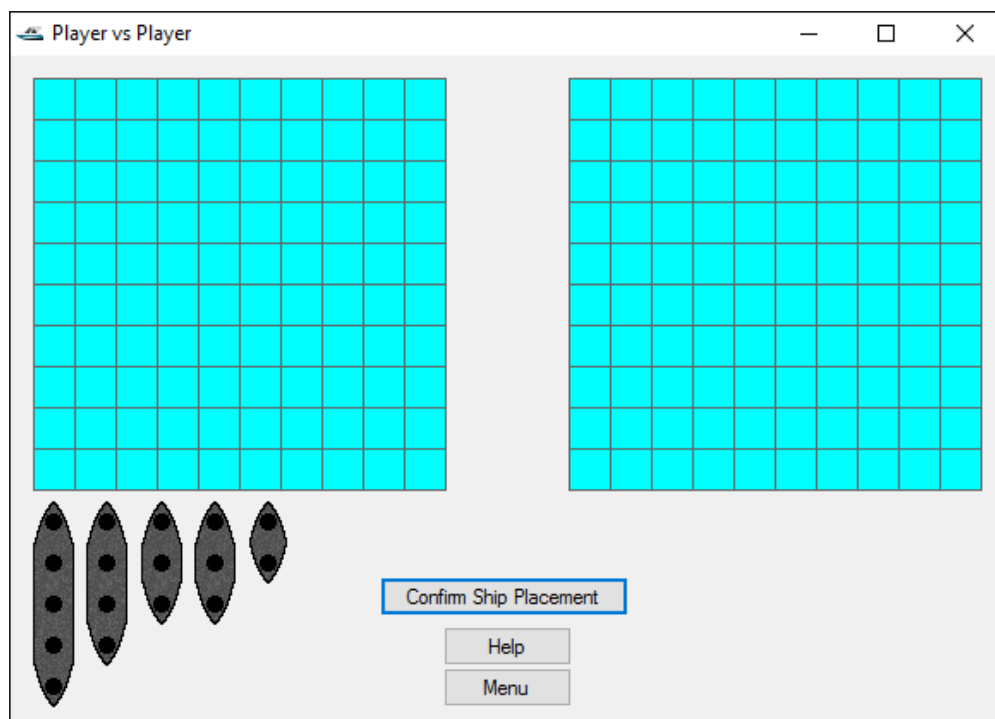
To play against a computer player, click "Player vs Computer"

If you selected Player vs Computer, skip to the section marked "Player vs Computer"

If you selected Player vs Player, continue following the next steps

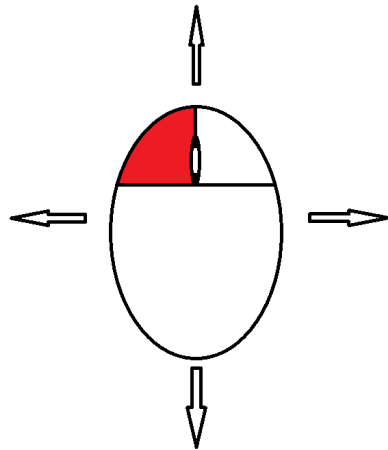
## Player vs Player

After game mode selection, you will be brought this screen



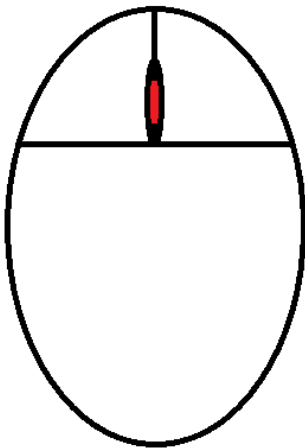
This is the starting screen where you will place your ships

To place a ship, click the left mouse button while the cursor is over a ship and move the mouse to drag that ship around.

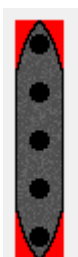


Release the left mouse button to place the ship. Make sure it is inside the blue grid on your side, left for player 1 or the first player to put down their ships and right for player 2 or the second player to put down your ships. Also make sure that your ships do not overlap one another.

To rotate ships, put the cursor over them and scroll the mouse wheel either up or down.



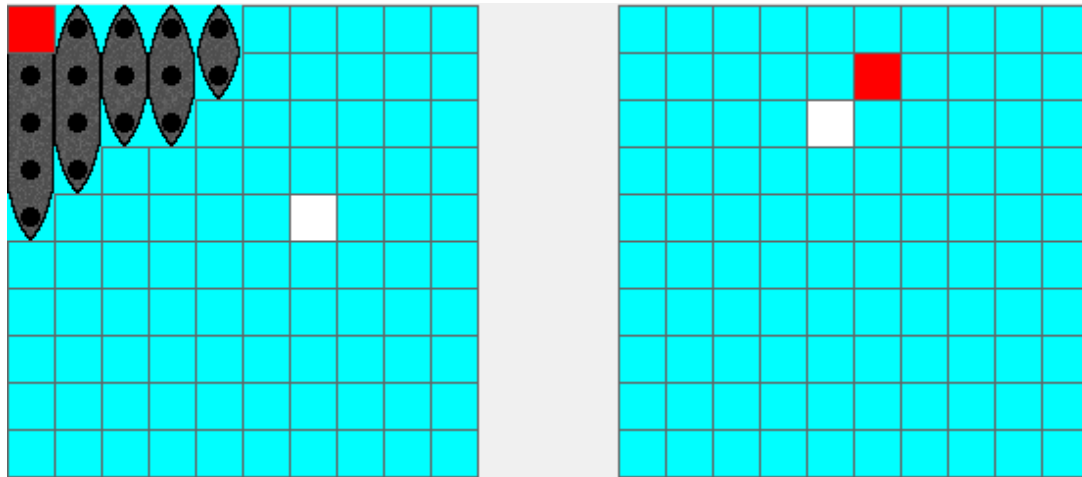
Once you're happy with your ship placement, click the Confirm Ship Placement button. If there is an error with the placement of one of your ships, it will gain a red background, seen below, so then it can be correctly easily.



James Halley

It will then be the second player's turn to place ships. The same principles apply in placement. Once happy with placement click the Confirm Ship Placement button.

It will then be player 1's turn to fire. Click on the opposing sides grid space to attack that square. After a player fire's it will give the result of the fire. If it was a hit, the square will turn red. If it was a miss, it will turn white, seen below.

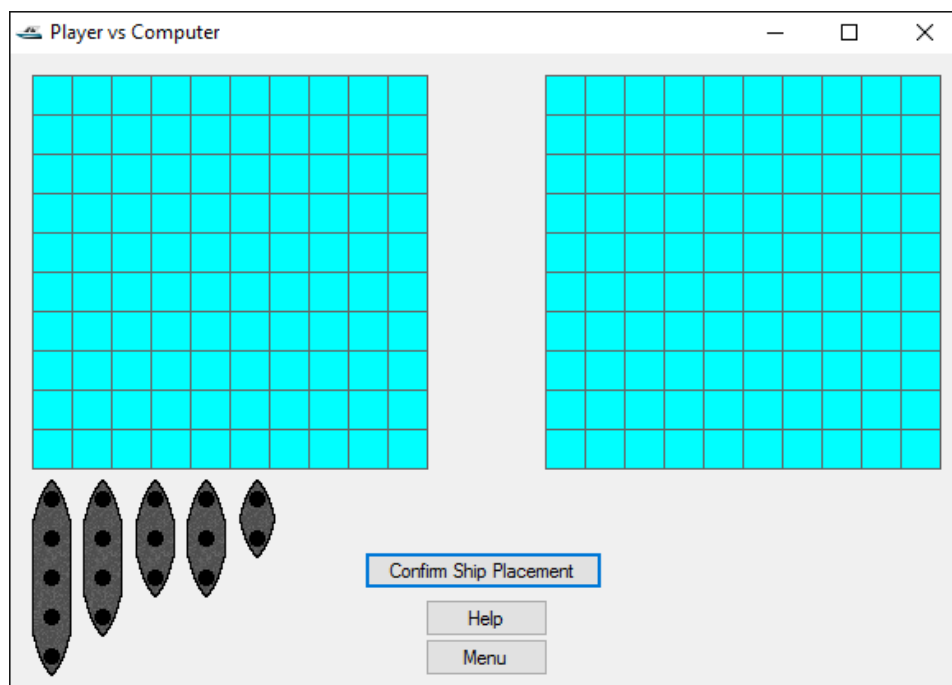


After this it will be player 2's turn to fire. Take turns alternating firing until one player has sunk all the opposing ships. You will be brought to the menu after the game has been finished.

If at any point during the game you wish to access the menu again, click the Menu button.

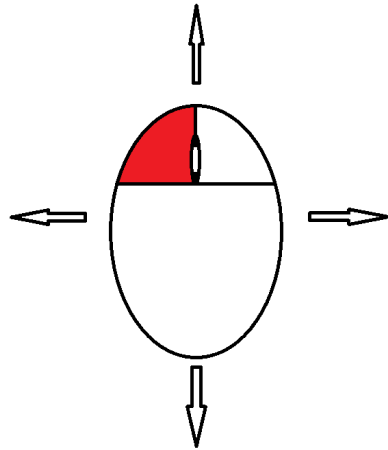
## Player vs Computer

After game mode selection you will be brought to this screen



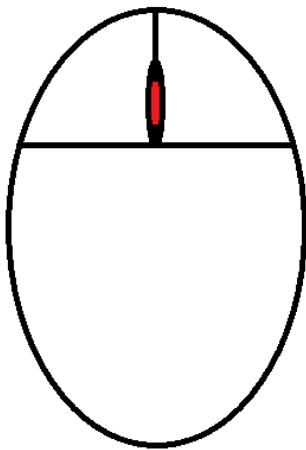
This is the starting screen where you will place your ships

To place a ship, click the left mouse button while the cursor is over a ship and move the mouse to drag that ship around.

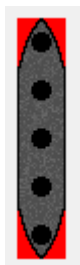


Release the left mouse button to place the ship. Make sure it is inside the blue grid on the left side as it is your side. Also make sure that your ships do not overlap one another.

To rotate ships, put the cursor over them and scroll the mouse wheel either up or down.

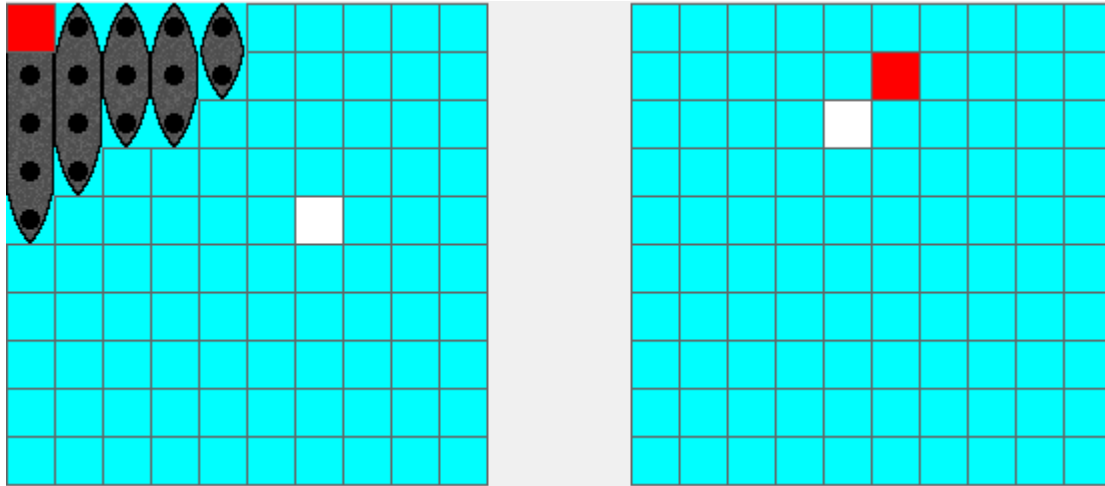


Once you're happy with your ship placement, click the Confirm Ship Placement button. If there is an error with the placement of one of your ships, it will gain a red background, seen below, so then it can be corrected easily.





After the placement of ships, the computer will have it's turn. After firing for either player it will give a result of either a hit (indicated by red) or a miss (indicated by white) on the corresponding square that was fired at, seen below.



Once the computer has had it's turn, it is the player's turn. To fire, click on the opposing grid and it will tell you what result it was. Play continues until someone has sunk all the other's ships.

If at any point during the game you wish to access the menu again, click the Menu button.

# Evaluation

Through my development of this program, I have tried to comply with as many social and ethical concerns in software development as was feasible although, what I have created could address the inclusivity part of social and ethical concerns more.

I have used feedback to the player in the form of text and graphics that supports social and ethical concerns although, reflecting on what has been done, the program could be more inclusive such as how it does not support multiple languages, specifically people with disabilities that may limit their ability to play the game and possibly those in other cultures who may not be as experienced using a computer as myself.

Although, I do believe I have complied with social and ethical in regards to consistency throughout the program as the buttons between the 2 player and 1 player are in the same area and mostly throughout the program with the exception of the menu, buttons are located at the bottom of the screen. I also believed I have addressed social and ethical issues by the inclusion of "ALT key" shortcuts and tried to minimise movement of the mouse done by the user, although the message boxes that appear to indicate a miss/hit and who's turn it is might be in a position where some may consider it to be too far for the mouse to move, although again enter can be pressed to move through these messages.

I believe that my attempt to follow social and ethical concerns within my own program, although possibly not considering potential audience as no clear audience was given, could be considered to be improving society specifically the area around software and program development in regard to social and ethical issues. However the issue of inclusion may be an issue as said before from disability, social and cultural background and language barriers.