The most difficult part of space invader game is indeed identifying problem.But difficulties is differ in each assigment.In Input manager assigment the programmig is the diffcult part.For spritem system i somewhat manage to idendify the problem and put solution to that problem but debugging is pain.For collision system is i couldnt figure out how do it . After ı saw some examples from internet and other students code i try to understood it .And ı understand my approach for sprite system is not good for collision system so i start from begining and write sprite system again try to implement flyweight pattern and singleton to my code and after compilated start collision system.After ı understood the how to do it came up some solutions to other problems easily.After I learn singleton patter life become easier for me actually i use singleton to every one object ship, wall, super and other only one objects.Beacuse of you can use singleton class anywhere in the project access for its methods become easier to me.If i start again for this project i dont start from sprite system as we did. I start from creating gameobject and it is manager after sprite system and collison system.I this this will be more fitted for me beacuse i struggle to undersdant diffirence between sprite and gameobject.At first i think sprite is game object whey we need another collision object we can use sprites boundries as collision but after i understand what is game object what is sprite i start to get any ideas.

I used there pattern for this project.Singleton,flyweight and vistor.At first i dont have any clue about design patter so i think after assigments done i can refactor it but time is runnig out for me so i usually skip to learn desing pattern.After i struggle with collison system project and undersdant desing patterns is needed for this project not just this project generally i start do some experiments with then becasue i was thinking i failed to compilate Assigment three.After learni singleton as ı mentoined i start to use it every where i addicted to it.For flyweight pattern ı have some plans for later in my project but i think i failed to implement it correctly.I think if i change base class data from some method all the object that shared these propertis also change.Most of my experiments with flyweight i get this idea ,but for my code for changing direction of Alliens it failed so i use burute force for changing directions of Alliens beacause there is not much time to deadline for chancing core class of the program.There is also possibility that i did not understand correctly flyweight pattern properties.After i succesfully learn this two patter i decide i should use vistor patter for my collison beause most of the time when professor says it will be better if you do this way you shoul becasue its usulally go as his words.Like texture manaager i did not go in dept for texture manager for sprite system becasue there is only one texture we use so i think there is no need but when i near close to finish i think it will be better to do it beacuse if did i did not play with texture for strings in Menu class.My knowladge of sofware desing is change even i learn one design pattern.Now whenever i think this class must we one ı use singleton.It gives flexibility to me for using anywhere without creating a new one. I can say same thing

for other two beacsue i use only once. I try to implement composite patter for my hiearcy structure but rather than running out of time i face with some issue.Whenever i create collision object it only create five of then regardless of hiearcy so i try diffrent approach of composite pattern but resul was same.I also didnt know how to write tree so i use linklist within linklist as hiearcy group.Also another game object like colums an super. After linklist within linklis give me proper result of draw collison object ı use tihs approach rather than composite pattern.As i mentoined before i didnt have any clue of design pattern so i didnt look other patterns.

While developing this little game it give me a little hint of how is game development, First of all i understand there is no such a thing like debug in game development , when i faced with bug , gettring rid of it was to hard and u can pinpoint breakpoint and say this is the error or bug,there is still some bugs that i could not solve it yet beacsue ı dont have any clue where is it.Debugging game is rather than breakpoint visualize what u expect and see if there is any error lik chage color or brick when missle hits it.But i couldnt get how to work as team ,i am pretty sure game compaines out there work as tem because it will be impossibe one guy to make tripple A games for market .I wish ı could also get that experiance it. I got what i expected from software development becasue now ı start to call myself programmer after design even this little game.It is hard but fun,and everchanging.Always someting updating, i expect this will we hard , the path ı choose will be hard and i am getting what i am expecting.I am not bored or hate it , i like programming. Start from now on after this small project i call myself developer before this course the knowladge i know is nothing.For develoing more complex games easily i must learn design patterns.Actually its not only game developer but all people who is in this sector must know.Also understanding more object orianted sofware design and most importantly make small system work together without coupling ,because if there is coupling then probability of bug in code is increase, i saw this in my little porject.While there is no coupling i can find bug easily but after i add bomb class and ufo and i got a but i couldny solve.Understangin problem also make high impact on developing game more easier.

Fist of all i understood i dont know anything about programming, i dont use abstact class, iterface, and design pattern. For my future i need to learn this properly and implement my coding style.I think i need more abstact class in my code, Also desing patterns are must learn after i saw flexibility of singliton for must cases so if there is a pattern for most cases to make my code easy readible and and made it easier to use than ı shoul learn it. Second i need to think more object-oriented , ı usually wite code in C so my coding style is not use class so much one class that do two of other classes are better for me. But after take this course i saw little pieces of puzzle is better. Managers manage little part of main program is better than one class or

program that do everything.