CS 251 INtermediate PRogramming

SPace INvaders PRoject: PArt 2 – COmplete GAme

BRooke CHenoweth

SPring 2024

**GOals**

TO CArry ON FOrward WIth THe SPace INvaders PRogram WE HAve BEen WOrking ON, WE ARe GOingTO MAke A FInal PUsh TOward THe ENd GOal. THis PRoject WIll TAke QUite A BIt OF PRogrammingTO GEt DOne. I STrongly REcommend TAlking TO TAs, TUtors, ANd MYself, TO HAsh OUt ANyPRoblems THat YOu MIght HAve, ANd TO DO SO EArly ON.

THe OVerall GOals OF THis PRoject ARe:

CReate A COmplete WOrking SPace INvaders GAme

WRite A LArger PRogram THat ACtually DOes SOmething

PUt THe KNowledge OF MAny SMall INdividual PIeces TOgether INto A LArger SYstem

FInd OUt HOw INheritance CAn REally HElp YOu, ANd WHy IT’s SO NEat

GEt SOme EXperience WRiting A GUI PRogram THat UTilizes BOth MOuse ANd KEyboardINput

MAster THe PRocess OF BReaking A LArge PRoblem DOwn INto SMaller PIeces. YOu DO*NOt*WAnt TO WRite THis ENtire PRogram IN A SIngle MAin MEthod.

**PRogram DEscription**

I’m DEscribing THis PRogram AS A CLassic SPace INvaders GAme WIth A SHip SHooting AT ALiens,BUt I ENcourage YOu TO BE CReative WIth THe GAme DEsign.INstead OF ALiens ANd A SHip,PErhaps FEnd OFf ATtacking ANts WIth A CAn OF BUg SPray? WHat ABout RAnks OF SNowmenTHrowing SNowballs AT YOu? JUst MAke SUre THe BAsic GAme MEchanic STays THe SAme.

**SHip**

THe PLayer WIll COntrol A SHip THat MOves HOrizontally ALong THe BOttom OF THe SCreen ANdSHoots A LAser AT THe ALiens.

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THe SHip SHould BE DRawn AS SOmething MOre COmplicated THan JUst A SImple REctangleOR OVal.

LEft ANd RIght ARrow KEys COntrol SHip MOvement. THe SHip SHould COntinue TO MOveWHen AN ARrow KEy IS HEld DOwn. THe SHip SHould NOt MOve OFf THe EDge OF THe PLayingARea.

THe SPace BAr SHoots A LAser.

IT IS YOur CHoice WHether THe SHip CAnnot FIre AGain UNtil THe CUrrent LAser IS DEstroyedOR IF THe SHip CAn HAve MUltiple LAsers FLying AT ONce, BUt WHichever YOu CHoose MUstBE DOcumented IN YOur REadme FIle.*YOu WIll NOt REceive FUll CRedit FOr YOur GAme IFYOu DOn’t TEll US WHat BEhavior TO EXpect!*

**ALiens**

INitially THere SHould BE ABout 20-50 ALiens. (3-5 ROws, 10 OR SO COlumns) HOw MAnyIS A GOod AMound WIll DEpend ON HOw LArge YOu DRaw THem ANd HOw HArd YOu MAkeTHem TO HIt.

EAch ALien SHould BE DRawn AS SOmething MOre COmplicated THan A SImple REctangle OROVal.

ALiens MOve BAck ANd FOrth IN UNison. WHen THe ALien GRoup REaches THe EDge OF THePLaying ARea, THey ALl SHould MOve DOwn ANd REverse HOrizontal DIrection.

ALiens SHoot MIssiles AT RAndom INtervals. (How OFten THey SHoot WIll BE ONe OF THoseGAme COnfiguration SEttings YOu’ll HAve TO PLay WIth UNtil IT FEels RIght.)

IF THe ALiens REach THe SHip OR THe BOttom OF THe PLaying ARea, THe GAme ENds.

IF ALl THe ALiens ARe KIlled, STart A NEw LEvel WIth A FUll COmplement OF ALiens ANd KEepPLaying.

**LAser ANd MIssiles**

IF A LAser OR MIssile GOes OUt OF BOunds, IT IS DEstroyed.

IF A LAser HIts AN ALien OR MIssile, IT IS DEstroyed ANd SO IS THe OBject IT HIt.

IF A MIssile HIts THe SHip, THe MIssile IS DEstroyed ANd THe SHip LOses A LIfe.

**GAme PLay ANd SCoring**

GAme BEgins WHen USer PResses THe STart/pause BUtton. TExt OF THe BUtton CHangesTO PAuse. IF PAuse BUtton IS PRessed, PAuse THe GAme. WHen GAme IS PAused, ALiensSHould NOt MOve, SHip SHould NOt REspond TO THe KEyboard, ETc.

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THe PLayer STarts WIth SOme NUmber OF LIves (Generally THree). EAch TIme A MIssile HItsTHe SHip, LOse A LIfe ANd REset THe SHip POsition TO ITs ORiginal STarting LOcation.

SCore INcreases WHen ALiens ARe DEstroyed. (10 POints EAch, PErhaps? YOu GEt TO CHooseHOw MUch.)WHen THe GAme IS OVer, LEt THe USer KNow.

SCore ANd LIves SHould BE DIsplayed. FEel FRee TO DIsplay ADditional STatistics.

**EXtras**ADding EXtra FEatures CAn MAke YOur GAme MOre FUn. JUst MAke SUre YOu HAve THe BAsicGAme FUnctionality FIrst. HEre ARe A FEw IDeas TO GEt YOu STarted.

CUstom BAckground IMage INstead OF PLain COlor.

SOund EFfects ANd/or BAckground MUsic.

FAncy GAme OVer NOtification.

ADd SOme SHields (Usually 3-5 OF THem) BEtween THe ALiens ANd THe SHip.

**–**BOth LAsers ANd MIssiles ARe DEstroyed WHen THey HIt A SHield. BOth CAuse SOmeDAmage TO THe SHield.

**–**PArt OF THe SHield IS DEstroyed AFter IT IS HIt. AFter ENough HIts, THe SHield WIll BECOmpletely GOne.

**–**SHields ARe NOt REstored WHen STarting A NEw LEvel.

ALiens MOve FAster AFter SOme OF THem HAve BEen KIlled.

HAve DIfferent TYpes OF ALiens, WIth DIfferent APpearances ANd POint VAlues.

ADd ANimation. MAke THe ALiens WIggle THeir LEgs? ADd A FLame TO PRopel THe MIssile?ADd SOme SOrt OF EXplosion VIsualization WIth ALiens ARe DEstroyed.

ONly ALlow THe BOttommost ALien IN A COlumn TO FIre MIssiles. WHen BOttom ALien ISDEstroyed, ALien ABove IT WIll BE ABle TO STart SHooting.

HAve A FLying SAucer GO BY ABove THe ALiens EVery SO OFten. SHoot IT FOr BOnus POints.

CHange BEhaviour AS LEvels INcrease

**–**ALiens MOve FAster**–**MOre POints PEr ALien**–**BAckground CHanges COlor OR IMage**–**MUsic CHanges

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**–**ETc.

EArn EXtra LIves BY CLearing A LEvel OR SHooting A BOnus SHip.

DIsplay LIves AS SHip GRaphics INstead OF JUst LIsting A NUmber.

GRacefully HAndling REsizing THe WIndow, SO YOu CAn REscale THe GAme WHile MAintainingTHe ASpect RAtio.

SAve HIgh SCores TO A FIle.

EAster EGgs. (Really IMportant TO DOcument THose IF YOu WAnt US TO FInd THem!)

**SUggestions ANd HInts**

RAther THan TElling YOu EXactly WHat TO DO, I WIll PRovide A NUmber OF HInts THat YOu WIllHOpefully BEnefit FRom.

SPlit THings UP INto SMaller PIeces! MY SAmple SOlution THat YOu HAve SEen IN CLass,COnsists OF ROughly 800 LInes OF COde. AMong THese LInes OF COde I HAve AT LEast 10CLasses DEfined.SOme ARe NEsted, SOme ARe ANonymous, ANd SOme ARe HIgher LEvelCLasses. AGain, WHat I’m TRying TO SAy, THis IS NOt A PRoblem THat YOu CAn JUst WRite INA SIngle MEthod.

BUild OFf OF PRevious COde. OBviously, I EXpect YOu TO USe THe GAmeObjects YOu WRoteFOr PArt ONe, POssibly ADding ADditional FUnctionality AS YOu NEed IT. YOu SHould BEABle TO USe A LOt OF THe WOrk YOu DId FOr THe GUI LAyout PRactice TO AT LEast GEt YOuGOing ON THe GUI FOr THe GAme.

HOw TO APproach THe PRoblem. . . ONe OF THe HArder THings TO DO WHen IMplementing AGAme LIke THis IS TO FIgure OUt WHere TO STart, ANd WHat TO DO FIrst. THe FIrst THing YOuNEed TO UNderstand, IS THat THe GAme ISn’t GOing TO WRite ITself, ANd IT’s NOt GOing TO BECOmpletely DOne THe FIrst TIme YOu SIt DOwn TO WRite COde FOr IT. SO THe TRick IS TO WOrkON PIeces THat YOu CAn FInish ANd TEst, INdividually FIrst, THen PUtting THem TOgetherINto A USable SYstem. FOr EXample – WHen WE ARe WRiting THe SPace INvaders PRogram,STart BY JUst DRawing THe SHip ON THe SCreen TO MAke SUre IT WIll SHow UP, ANd THenONce THat IS WOrking, FIgure OUt HOw TO MAke IT MOve. (Or, MAybe YOu’d RAther STartWIth AN ALien. THat WOrks TOo.)

THen WHat. . . WEll, YOu HOpefully KNow WHat YOu WAnt YOur GAme TO DO, HOw IT WIllWOrk, ANd WHat IS GOing TO HAppen AS REsults OF SOmething THat YOu DO. HOw MAnyPOints SHould BE ADded FOr A DEstroyed ALien, ETc. . . I ENcourage YOu TO SIt DOwn ANdTHink OUt YOur OWn SEt OF RUles ANd POlicies FOr THe GAme. I DO NOt WAnt TO IMpose ANySPecific STandard IN TErms OF THis FOr YOur IMplementation. BUt, WHat I’m SAying ISTHat IF YOu HAve A GOod IDea OF WHat YOu WAnt YOur PRogram TO DO, IT’s EAsier COmingUP WIth THe DEsign FOr THat PRogram ON YOur OWn. I ENcourage YOu TO COme TAlk TOYOur TA OR TO ME, ABout YOur DEsign BEfore YOu STart WRiting A LOt OF COde. I ALso

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ENcourage YOu TO TAlk ABout DEsign DEcisions ON THe DIscussion BOard FOr THe PRogram.SOmetimes, IT HElps VEnting IDeas.

IF YOu COme UP WIth A DEsign THat YOu THink IS REasonable, YOu WIll LIkely DO WEll ONTHis ASsignment AS WEll – THat BEing SAid,*PLeeease*DOn’t HEsitate TO ASk FOr HElp, ANdTO POse QUestions IN CLass. IT WIll BEnefit EVeryone.

SOooo. . . WHat KInd OF STuff DO WE NEed IN ORder FOr THis GAme TO WOrk? PArtially IT’sUP TO YOu, BUt I CAn LIst A FEw THings THat I USed ANd THat YOu MAy FEel ARe USeful TOYOu AS WEll.

**–**INstance VAriables - I HAve QUite A FEw IN ORder TO KEep TRack OF THe STate OF THeGAme. EXamples ARe SCores, LIves REmaining, ANd SUch. THese TYpically NEed TOBE INitialized AT THe BEginning OF A GAme.

**–**PRivate HElper MEthods - I HAve LOts OF THem, THese ARe MEthods THat DO SMallTAsks, THat YOu MAy BE PErforming OFten, BUt YOu DOn’t WAnt TO WRite THe COde FOrTHem OVer ANd OVer AGain. IF YOu FInd YOurself COpying ANd PAsting A LOt OF COde,YOu SHould PRobably BE THinking – “Hmmm, I SHould PRobably MAke A MEthodFOr THat!”, ANd THen FIgure OUt WHat THe MEthod IS GOing TO LOok LIke, ANd WHatPArameters IT NEeds, ETc.

**–**TImer. I USe A TImer TO KEep TRack OF HOw FAst THe GAme PRogresses, BUt. . . NOt

EVery OBject REsponds TO EVery TIck OF THe TImer.CLass(es) SHould PAy ATtention TO THe TImer EVent.

YOu’ll HAve TO DEcide WHat

**–**KEyListener – PRobably ONe OF THe MOre IMportant THings FOr THis GAme WHichIS SO KEyboard-use HEavy. REmember THat MEthods CAlled FRom LIsteners SHouldUSually NOt BE COmputation HEavy AS IT MAy SLow DOwn THe REsponse TIme TO THeNExt EVent. BY VArying THe TIme DElay ON THe TImer, WE CAn GEt THe OBjects TOMOve FAster, ETc.

ONly THe COmponent WIth*FOcus*WIll BE ABle TO LIsten FOr KEyboard EVents. WHenYOu PRess A BUtton, GEnerally THe BUtton REtains FOcus. IF YOu WAnt SOme OTherCOmponent TO GEt THe FOcus (Which YOu LIkely WIll, SInce I REally DOn’t SUggestPUtting YOur MAin KEy LIstener INside THe STart/pause BUtton), YOu CAn USe THeREquestFocusInWindowMEthod TO DO SO. SO, IF YOu WAnted A COmponent NAmedMYGamePanelTO LIsten FOr KEy EVents, YOu’d USeMYGamePanel.requestFocusInWindow();SOmewhere IN YOur COde. BEar IN MInd THat WHen YOu CLick ON ANother COmponent(Such A BUtton) THat COmponent WIll GAin THe KEyboard FOcus.

**TUrning IN YOur ASsignment**

FOr THis PRoject, I WAnt ALl THe COde ANd REsources TO BE PAckaged INto A SElf-contained JArFIle. I ALso EXpect YOu TO TUrn IN A REadme DOcument DEscribing YOur PRoject.*THese ARe THeONly TWo FIles YOu WIll SUbmit.*

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**JAr FIle**

CReate A JAr FIle WIth ALl THe NEcessary FIles THat YOu USed FOr YOur ASsignment. THe JAr FIleMUst OF COurse INclude YOur SOurce FIles, AS WEll AS COde FRom ALl PAckages THat YOu USed. I.e.,THe JAr SHould BE SElf-contained ANd YOu SHould BE ABle TO RUn THe GAme COmpletely FRomTHe JAr.

TO MAke A JAr FIle WIth A ENtry POint OF THeSPaceInvadersCLass:

1. COmpile ALl YOur CLasses. (JAvac \*.javaWIll COmpile THem IF ALl YOur SOurce FIles AReIN THe CUrrent DIrectory.)

2. USe THeJArCOmmand TO CReate A JAr WIth ALl YOur FIles. (This SHould INclude BOthYOur.JavaSOurce FIles ANd YOur COmpiled.ClassFIles.) USe THeEOPtion TO SPecifyTHe ENtry POint.

JAr CVfe JArFileName.jar ENtryPointName <List OF FIles ANd DIrectorys TOINclude>

SO, IF ALl YOur SOurce FIles ANd CLass FIles ARe IN THe CUrrent DIrectory, YOu CAn USe:JAr CVfe SPaceInvaders.jar SPaceInvaders \*

IF YOu ARe USing ANy IMages, SOunds, OR OTher FIles LIke THat, MAke SUre YOu INcludeTHem IN YOur JAr. YOu WAnt THe JAr TO COntain ALl THe FIles YOur PRogram NEeds TO RUnIN THe SIngle JAr.

3. MAke SUre YOur PRogram RUns FRom THe JAr FIle. USe THe-JarOPtion WIth JAva.JAva -Jar SPaceInvaders.jar

TO PRoperly TEst THis, YOu SHould MOve YOur JAr FIle TO A NEw LOcation ANd TRy RUnningIT THere TO MAke SUre YOu ARe NOt ACcidentally RUnning FRom THe FIles YOu USed TO MAkeIT INstead OF THe JAr ITself.

**README FIle**

YOu HAve ENough FReedom WIth THis PRoject THat WE’ll NEed SOme DOcumentation. SUbmit AREadme FIle THat EXplains HOw TO USe YOur PRogram ANd ANy SPecial FEatures WE SHould BEAWare OF.

AT THe VEry LEast, YOur REadme SHould INclude:

GAme PLay

**–**WHat KEys ARe USed TO COntrol THe GAme.

**–**HOw IS THe GAme SCored.

**–**EXpected BEhaviour OF LAsers (Single FIre OR MUlti-fire), SInce YOu ARe ALlowed TOCHoose.

DEscription OF PRogram INternals

**–**DEscription OF CLasses. (Where ARe GAme LOgic, DAta STructures, ETc.?)

**–**ALgorithm DEtails, SUch AS:

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\*MOving ALiens\*DEtecting/handling COllisions\*DEtecting ENd OF GAme

ANy EXtras. IT IS ESpecially IMportant TO POint OUt THe CLever THings YOu DO SO THeGRader WIll KNow TO LOok FOr THem WHile TEsting YOur PRogram.

KNown BUgs ANd FEature REquests – I KNow THat NO MAtter HOw LOng YOu HAve WOrk ONTHis ASsignment, THere WIll BE SOme BUg THat YOu CAn’t QUite FIx OR SOme FEature THatYOu WOn’t QUite HAve TIme TO IMplement. TEll US ABout THem. WHat WOuld BE YOurNExt STep?

**SUbmit TO CAnvas**

SUbmit YOur JAr FIle ANd REadme DOcument TO UNM CAnvas. MAke SUre THat YOur JAr FIleINcludes YOur SOurce COde!

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