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INFORMATIKOS FAKULTETAS

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# Python (L1)

## Darbo užduotis

<https://onlinejudge.org/index.php?option=com_onlinejudge&Itemid=8&category=3&page=show_problem&problem=75>

## Programos tekstas

**class** TelephoneInfo:  
 **def** \_\_init\_\_(self, code, name, price):  
 self.code = code  
 self.name = name  
 self.price = price  
  
 **def** priceSeconds(self):  
 **return** round(self.price \* 0.1, 2)  
  
**class** TelephoneCalls:  
 **def** \_\_init\_\_(self, number, time):  
 self.number = number  
 self.time = time  
  
**class** Data (TelephoneInfo, TelephoneCalls):  
 **def** \_\_init\_\_(self, number, code, name, price, time):  
 self.number = number  
 self.code = code  
 self.name = name  
 self.price = price  
 self.time = time  
  
 **def** calcuPrice(self):  
 **return** float(self.price) \* 0.1 \* float(self.time)  
  
 **def** \_\_str\_\_(self):  
 **if** self.code != -1:  
 **return "{0:15} {1:16} {2:8} {3:6} {4:6} {5:.2f}\n"**.format(self.number, self.name, self.code, self.time, str(self.priceSeconds()), self.calcuPrice())  
 **else**:  
 **return "{0:15} {1:16} {2:8} {3:6} {4:6} {5:.2f}\n"**.format(self.number, self.name, **""**, self.time, **""**, float(self.price))  
  
  
**class** Main:  
  
 **def** \_\_init\_\_(self, read, write):  
 self.readFromFile = read  
 self.writeToFile = write  
  
 **def** dataRead(self):  
 data = []  
 file = open(self.readFromFile, **"r"**)  
 **for** dataFromFile **in** file:  
 data.append(dataFromFile)  
 file.close()  
 **return** data  
  
 **def** splitLine(self,dataFromFile):  
 split = []  
 listForInfo = []  
 listForCalls = []  
 info = **False  
 for** i **in** dataFromFile:  
  
 index = 0  
 **if** len(split) == 2 **and** info:  
 split = []  
 **elif not** info:  
 split = []  
  
 **for** string **in** i:  
 **if** string == **" "**:  
 split.append(i[0:index])  
 split.append(i[index + 1: len(i)])  
 **break** index += 1  
 **if** index == len(i):  
 split.append(i.strip())  
split[0] = split[0].strip()  
 **if** len(split) > 1 **and not** bool(info):split[1] = split[1].strip()  
 data = split[1].split(**'$'**)  
 telephoneInfo = TelephoneInfo(split[0], data[0], float(data[1]) \* 0.1)  
 listForInfo.append(telephoneInfo)  
 **elif** len(split) == 1 **and** split[0] == **"000000" and not** bool(info):split = []  
 info = **True  
 elif** len(split) > 1 **and** bool(info):  
 split[1] = split[1].strip()  
 calls = TelephoneCalls(split[0], split[1])  
 listForCalls.append(calls)  
 **return** listForInfo, listForCalls  
  
 **def** calculatePrice(self, listOfCall, listOfInfo):  
 calculatedData = []  
 **for** calls **in** listOfCall:  
 state = **False  
 for** info **in** listOfInfo:  
 **if** calls.number[0:len(info.code)] == info.code:  
 data = Data(calls.number, calls.number[len(info.code):len(calls.number)], info.name, info.price,  
 calls.time)  
 calculatedData.append(data)  
 state = **True  
 break  
 elif** calls.number[0] != **"0"**:  
 tempInfo = TelephoneInfo(calls.number, **"Local"**, 0)  
 data = Data(calls.number, tempInfo.code, tempInfo.name, tempInfo.price, calls.time)  
 calculatedData.append(data)  
 state = **True  
 break  
 if not** bool(state):  
 data = Data(calls.number, -1, **"Unknown"**, -1, calls.time)  
 calculatedData.append(data)  
 **return** calculatedData  
  
 **def** saveData(self, calculatedData):  
 fSave = open(self.writeToFile, **"w+"**)**for** data **in** calculatedData:  
 fSave.write(str(data))  
 fSave.close()  
  
 **def** run(self):  
 fileData = self.dataRead()  
 infoList, callsList = self.splitLine(fileData)  
 dataList = self.calculatePrice(callsList, infoList)  
 self.saveData(dataList)  
  
main = Main(**"test.txt"**, **"data.txt"**)  
main.run()

## Pradiniai duomenys ir rezultatai

|  |  |
| --- | --- |
| **Pradiniai duomenys** | **Rezultatai** |
| 088925 Broadwood$81 03 Arrowtown$38 0061 Australia$140 000000 031526 22 0061853279 3 0889256287213 122 779760 1 002832769 5 # | 031526 Arrowtown 1526 22 0.38 8.36 0061853279 Australia 853279 3 1.4 4.20 0889256287213 Broadwood 6287213 122 0.81 98.82 779760 Local 779760 1 0.0 0.00 002832769 Unknown 5 -1.00 |

# Scalatron botas

## Darbo užduotis

Sukurti Scalatron botą.

Reikalavimai:

1. Panaudoti bent kelis master boto išleidžiamus botų padėjėjų tipus (pvz.: minos, raketos į priešus, "kamikadzės", rinkikai, masalas ir pan.)
2. Panaudoti bet kurį vieną iš kelio radimo algoritmų (DFS, BFS, A\*, Greedy, Dijkstra).

Realizuotos minos, gyvųnų gaudytojai/rinkikai ir „Kamimadzė“ akytvus botai, modifikuotos agresyvios ir apsauginės raketos.

Master botas, gyvųnų gaudytojai/rinkikai ir „Kamikadzė“, kelio radimui naudoja Djikstros algoritmą.

## Programos tekstas

import scala.util.control.Breaks.\_

import scala.math.sqrt

import java.util

import scala.collection.mutable.ListBuffer

object ControlFunction

{

def forMaster(bot: Bot) {

val (directionValue, nearestEnemyMaster, nearestEnemySlave) = analyzeViewAsMaster(bot)

val dontFireAggressiveMissileUntil = bot.inputAsIntOrElse("dontFireAggressiveMissileUntil", -1)

val dontFireDefensiveMissileUntil = bot.inputAsIntOrElse("dontFireDefensiveMissileUntil", -1)

val lastDirection = bot.inputAsIntOrElse("lastDirection", 0)

val dontPlantMineUntil = bot.inputAsIntOrElse("dontPlantMineUntil", -1)

val dontReleaseKamekadzeUntil = bot.inputAsIntOrElse("dontReleaseKamekadzeUntil", -1)

val dontGatherFood = bot.inputAsIntOrElse("dontGatherFood", -1)

val direction = XY.fromDirection45(directionValue)

bot.move(direction) //give straight direction

bot.set("lastDirection" -> directionValue)

// food gathering bot, this bot gathers 1500 energy with givven and try return back to master

if(dontGatherFood < bot.time && bot.energy > 500){

bot.view.offsetToNearest('P') match {

case Some(delta: XY) =>

bot.set("rx" -> delta.x, "ry" -> delta.y)

val unitDelta = XY.fromDirection45((lastDirection + 4) % 8)

bot.spawn(unitDelta, "energy" -> 400, "mood" -> "Gather")

bot.set("dontGatherFood" -> (bot.time + delta.stepCount + 1))

case None =>

}

bot.view.offsetToNearest('B') match {

case Some(delta: XY) =>

bot.set("rx" -> delta.x, "ry" -> delta.y)

val unitDelta = XY.fromDirection45((lastDirection + 4) % 8)

bot.spawn(unitDelta, "energy" -> 500, "mood" -> "Gather")

bot.set("dontGatherFood" -> (bot.time + delta.stepCount + 1))

case None =>

}

}

// mine planting

if(dontPlantMineUntil < bot.time && bot.energy > 600){

val unitDelta = XY.fromDirection45((lastDirection + 4) % 8)

bot.spawn(unitDelta, "energy" -> 400, "mood" -> "Mine")

bot.set("dontPlantMineUntil" -> (bot.time + 20))

}

// kamekadze if master sees other master kamikaze go to straight slave bot or him self

if(dontReleaseKamekadzeUntil < bot.time && bot.energy > 200) { // fire defensive missile?

bot.view.offsetToNearest('m') match {

case Some(delta: XY) =>

bot.set("rx" -> delta.x, "ry" -> delta.y)

val unitDelta = XY.fromDirection45((lastDirection + 4) % 8)

bot.spawn(unitDelta, "energy" -> 200, "mood" -> "Kamikadze")

bot.set("dontReleaseKamekadzeUntil" -> (bot.time + delta.stepCount + 1))

case None =>

}

}

if(dontFireAggressiveMissileUntil < bot.time && bot.energy > 100) { // fire attack missile?

nearestEnemyMaster match {

case None => // no-on nearby

case Some(relPos) => // a master is nearby

val unitDelta = relPos.signum

val remainder = relPos - unitDelta // we place slave nearer target, so subtract that from overall delta

bot.spawn(unitDelta, "mood" -> "Aggressive", "target" -> remainder)

bot.set("dontFireAggressiveMissileUntil" -> (bot.time + relPos.stepCount + 1))

}

}

else

if(dontFireDefensiveMissileUntil < bot.time && bot.energy > 100) { // fire defensive missile?

nearestEnemySlave match {

case None => // no-on nearby

case Some(relPos) => // an enemy slave is nearby

if(relPos.stepCount < 8) {

// this one's getting too close!

val unitDelta = relPos.signum

val remainder = relPos - unitDelta // we place slave nearer target, so subtract that from overall delta

bot.spawn(unitDelta, "mood" -> "Defensive", "target" -> remainder)

bot.set("dontFireDefensiveMissileUntil" -> (bot.time + relPos.stepCount + 1))

}

}

// vieta kazkokiai atakai

}

}

def forSlave(bot: MiniBot) {

bot.inputOrElse("mood", "Lurking") match {

case "Aggressive" => reactAsAggressiveMissile(bot)

case "Defensive" => reactAsDefensiveMissile(bot)

case "Mine" => reactAsMine(bot)

case "Kamikadze" => reactAsKamekaze(bot)

case "Gather" => reactAsHarvest(bot)

case s: String => bot.log("unknown mood: " + s)

}

}

// mine plant logic

def reactAsMine(bot: MiniBot) {

bot.view.offsetToNearest('m') match {

case Some(delta: XY) =>

bot.set("rx" -> delta.x, "ry" -> delta.y)

if (delta.length <= 3) {

// yes -- blow it up!

bot.explode(4)

}

case None =>

}

bot.view.offsetToNearest('s') match {

case Some(delta: XY) =>

bot.set("rx" -> delta.x, "ry" -> delta.y)

if (delta.length <= 3) {

// yes -- blow it up!

bot.explode(4)

}

case None =>

}

bot.view.offsetToNearest('b') match {

case Some(delta: XY) =>

bot.set("rx" -> delta.x, "ry" -> delta.y)

if (delta.length < 2) {

// yes -- blow it up!

bot.explode(4)

}

case None =>

}

}

// kamikadze exploads near master or slave if it cant find any of them then kamekazde self distructs

def reactAsKamekaze(bot: MiniBot) {

val direction45 = analyzeViewAsBot(bot, 1000)

val direction = XY.fromDirection45(direction45)

if(direction != XY(0,0))

{

bot.move(direction)

bot.view.offsetToNearest('m') match {

case Some(delta: XY) =>

bot.set("rx" -> delta.x, "ry" -> delta.y)

if (delta.length <= 4) {

// yes -- blow it up!

bot.explode(4)

}

case None =>

}

}

else

{

bot.explode(4)

}

}

// start react gathering bot move by found location and obsticles

def reactAsHarvest(bot: MiniBot) {

val (directionValue, nearestEnemyMaster, nearestEnemySlave) = analyzeViewAsMaster(bot)

val direction = XY.fromDirection45(directionValue)

bot.move(direction)

bot.set("lastDirection" -> direction.toDirection45)

}

def reactAsAggressiveMissile(bot: MiniBot) {

bot.view.offsetToNearest('m') match {

case Some(delta: XY) =>

// another master is visible at the given relative position (i.e. position delta)

// close enough to blow it up?

if(delta.length <= 2) {

// yes -- blow it up!

bot.explode(4)

} else {

// no -- move closer!

bot.move(delta.signum)

bot.set("rx" -> delta.x, "ry" -> delta.y)

}

case None =>

// no target visible -- follow our targeting strategy

val target = bot.inputAsXYOrElse("target", XY.Zero)

// did we arrive at the target?

if(target.isNonZero) {

// no -- keep going

val unitDelta = target.signum // e.g. CellPos(-8,6) => CellPos(-1,1)

bot.move(unitDelta)

// compute the remaining delta and encode it into a new 'target' property

val remainder = target - unitDelta // e.g. = CellPos(-7,5)

bot.set("target" -> remainder)

} else

}

}

def reactAsDefensiveMissile(bot: MiniBot) {

bot.view.offsetToNearest('s') match {

case Some(delta: XY) =>

// another slave is visible at the given relative position (i.e. position delta)

// move closer!

bot.move(delta.signum)

bot.set("rx" -> delta.x, "ry" -> delta.y)

case None =>

// no target visible -- follow our targeting strategy

val target = bot.inputAsXYOrElse("target", XY.Zero)

// did we arrive at the target?

if(target.isNonZero) {

// no -- keep going

val unitDelta = target.signum // e.g. CellPos(-8,6) => CellPos(-1,1)

bot.move(unitDelta)

// compute the remaining delta and encode it into a new 'target' property

val remainder = target - unitDelta // e.g. = CellPos(-7,5)

bot.set("target" -> remainder)

}

}

}

def analyzeViewAsMaster(bot: Bot) = {

var view = bot.view

val directionValue = Array.ofDim[Double](8)

var nearestEnemyMaster: Option[XY] = None

var nearestEnemySlave: Option[XY] = None

val cells = view.cells

val cellCount = cells.length

val cellWeights = Array.ofDim[Double](cellCount)

val indexRel = view.indexFromRelPos(XY(0,0))

//view.aStarPathfind(cellWeights, bot)

//bot.log(cells.contains('P').toString)

//bot.log(cells)

// this for creates heatmap for helping a\* algorith find road to position with weights

for(i <- 0 until cellCount) {

val cellRelPos = view.relPosFromIndex(i)

if(cellRelPos.isNonZero && !view.outOfBoundsRel(cellRelPos)) {

cells(i) match {

case 'm' => // another master: not dangerous, but an obstacle

nearestEnemyMaster = Some(cellRelPos)

for (x <- -4 to 4) {

for (y <- -4 to 4) {

val pos = cellRelPos + XY(x, y)

if (pos.isNonZero && !view.outOfBoundsRel(pos)) {

cellWeights(view.indexFromRelPos(pos)) += 10000

}

}

}

case 's' => // another slave: potentially dangerous?

nearestEnemySlave = Some(cellRelPos)

for (j <- 0 until cellCount) {

val pos = view.relPosFromIndex(j)

if(!bot.view.outOfBoundsRel(pos))

{

val stepDistance = cellRelPos.stepsTo(pos)

if (pos.isNonZero && stepDistance != 0) {

val stepDistance = cellRelPos.stepsTo(pos)

cellWeights(j) += 1000 / stepDistance

}

}

}

case 'P' =>

val pos = view.relPosFromIndex(i)

if(!bot.view.outOfBoundsRel(pos))

{

val stepDistance = cellRelPos.stepsTo(pos)

if (stepDistance == 1) cellWeights(i) += 100

else if (stepDistance == 2) cellWeights(i) += 300

else cellWeights(i) += 500

}

case 'B' =>

val pos = view.relPosFromIndex(i)

val stepDistance = cellRelPos.stepsTo(pos)

if (stepDistance == 1) cellWeights(i) += 50

else if (stepDistance == 2) cellWeights(i) += 200

else cellWeights(i) += 520

case 'b' =>

for (x <- -2 to 2) {

for (y <- -2 to 2) {

val pos = view.relPosFromIndex(i) + XY(x,y)

if(pos.isNonZero && !view.outOfBoundsRel(pos))

{

val index = view.indexFromRelPos(pos)

cellWeights(index) += 2500000

}

}

}

/\*case 'p' => // bad plant: bad, but only if I step on it

cellWeights(i) += 100000\*/

case 'W' => // wall: harmless, just don't walk into it

for (x <- -1 to 1) {

for (y <- -1 to 1) {

val pos = cellRelPos + XY(x, y)

if (pos.isNonZero && !view.outOfBoundsRel(pos)) {

cellWeights(view.indexFromRelPos(pos)) += 1500000

}

}

}

case '?' =>

cellWeights(i) += 1500000

case '\_' =>

cellWeights(i) += 2

case \_ => cellWeights(i) += 1

}

}

}

var direction45 = 0

val lastDirection = bot.inputAsIntOrElse("lastDirection", 0)

val lastCount = bot.inputAsIntOrElse("lastCount", 0).toInt

val previuosStepCount = bot.inputAsIntOrElse("PreviousStepCount", 0).toInt

if ((cells.contains('P') || cells.contains('B')) || (lastCount < 1 && lastCount > 2)) {

// finding closest target by weights around target and distance between target and master

var (closestFood) = findClosestThings(cellCount, cells, view, cellWeights, bot)

if(!closestFood.isZero)

{

var (path, path\_index, found) = aStarPathfind(cells, XY.Zero, view, closestFood, bot, cellWeights)

if(found && path.size > 0)

{

if(path(path.size - 1) != XY(0,0))

{

if(previuosStepCount == path.size)

{

bot.set("lastCount" -> 1.toString)

}

bot.set("PreviousStepCount" -> path.size)

direction45 = path(path.size - 1).toDirection45

bot.log(direction45.toString)

directionValue(direction45)

}

}

else

{

// if path not found it starts refrence bot algorithn

bot.set("lastCount" -> 1.toString)

}

}

else{

// after failed search of closest target it try again by adding bigger weight to previuos target

var (temp\_closestFood) = findClosestThings(cellCount, cells, view, cellWeights, bot)

if(!bot.view.outOfBoundsRel(temp\_closestFood) && !temp\_closestFood.isZero)

{

var index\_tmp = view.indexFromRelPos(temp\_closestFood)

cellWeights(index\_tmp) += cellWeights(index\_tmp) \* 2

var (closestFood) = findClosestThings(cellCount, cells, view, cellWeights, bot)

var (path, path\_index, found) = aStarPathfind(cells, XY.Zero, view, closestFood, bot, cellWeights)

if(found && path.size > 0)

{

if(path(path.size - 1) != XY(0,0))

{

if(previuosStepCount == path.size)

{

bot.set("lastCount" -> 1.toString)

}

bot.set("PreviousStepCount" -> path.size)

direction45 = path(path.size - 1).toDirection45

bot.log(direction45.toString)

directionValue(direction45)

}

}

else

{

// if path not found it starts refrence bot algorithn

bot.set("lastCount" -> 1.toString)

}

}

}

}

//refrence algorithm is used by bot when there are any targets in screnn or when playres last step is the same

else if((!cells.contains('P') && !cells.contains('B')) || (lastCount > 0 && lastCount < 3))

{

for(i <- 0 until cellCount) {

val cellRelPos = view.relPosFromIndex(i)

if(cellRelPos.isNonZero && !view.outOfBoundsRel(cellRelPos)) {

val stepDistance = cellRelPos.stepCount

val value: Double = cells(i) match {

case 'M' =>

1500000

case 'm' => // another master: not dangerous, but an obstacle

nearestEnemyMaster = Some(cellRelPos)

if(stepDistance < 2) -1000 else 0

case 's' => // another slave: potentially dangerous?

nearestEnemySlave = Some(cellRelPos)

-100 / stepDistance

case 'S' => // out own slave

0.0

case 'B' => // good beast: valuable, but runs away

if(stepDistance == 1) 600

else if(stepDistance == 2) 300

else (150 - stepDistance \* 15).max(10)

case 'P' => // good plant: less valuable, but does not run

if(stepDistance == 1) 500

else if(stepDistance == 2) 300

else (150 - stepDistance \* 10).max(10)

case 'b' => // bad beast: dangerous, but only if very close

if(stepDistance < 4) -400 / stepDistance else -50 / stepDistance

case 'p' => // bad plant: bad, but only if I step on it

if(stepDistance < 2) -1000 else 0

case 'W' => // wall: harmless, just don't walk into it

if(stepDistance < 3) -1000 else 0

case '?' =>

-1000

case '\_' => 10

case \_ => 0.0

}

direction45 = cellRelPos.toDirection45

directionValue(direction45) += value

val bestDirection45 = directionValue.zipWithIndex.maxBy(\_.\_1).\_2

direction45 = bestDirection45

}

}

bot.set("lastCount" -> (lastCount + 1).toString)

}

(direction45, nearestEnemyMaster, nearestEnemySlave)

}

// closest thing search

def findClosestThings(cellCount: Int, cells: String, view: View, weights: Array[Double], bot: Bot): (XY) = {

var distances = ListBuffer[Double]() // list of targets distances

var indexes = ListBuffer[Int]() // list of target indexes

var weightsForFood = ListBuffer[Double]() // target weights

for (i <- 0 until cellCount) {

val cellRelPos = view.relPosFromIndex(i)

if(cellRelPos.isNonZero && !view.outOfBoundsRel(cellRelPos)) {

cells(i) match {

case 'P' =>

indexes = indexes :+ i

var testWeight = 0.0

var cnt = 0

for (x <- -4 to 4) {

for (y <- -4 to 4) {

val pos = cellRelPos + XY(x, y)

if (pos.isNonZero && !view.outOfBoundsRel(pos)) {

testWeight += weights(view.indexFromRelPos(pos))

cnt += 1

}

}

}

var avgWeight = testWeight / cnt

val stepDistance = cellRelPos.stepCount

distances = distances :+ stepDistance.toDouble

// change distance by weights

if(avgWeight > 1500000)

{

distances(distances.size-1) += stepDistance / 2

}

if(avgWeight < 1500000 && avgWeight > 1000000 && bot.energy > 2500)

{

distances(distances.size-1) -= stepDistance / 3

}

if(avgWeight < 1000000)

{

distances(distances.size-1) -= stepDistance / 2

}

case 'B' =>

indexes = indexes :+ i

var testWeight = 0.0

var cnt = 0

for (x <- -4 to 4) {

for (y <- -4 to 4) {

val pos = cellRelPos + XY(x, y)

if (pos.isNonZero && !view.outOfBoundsRel(pos)) {

testWeight += weights(view.indexFromRelPos(pos))

cnt += 1

}

}

}

var avgWeight = testWeight / cnt

val stepDistance = cellRelPos.stepCount

distances = distances :+ stepDistance.toDouble

// by weights make shorter or longer distance

if(avgWeight > 1500000)

{

distances(distances.size-1) += stepDistance / 2

}

if(avgWeight < 1500000 && avgWeight > 1000000 && bot.energy > 2500)

{

distances(distances.size-1) -= stepDistance / 3

}

if(avgWeight < 1000000)

{

distances(distances.size-1) -= stepDistance / 2

}

case \_ =>

}

}

}

if(distances.nonEmpty)

{

// searching minimum distance index

val temp\_index = distances.indexOf(distances.min)

// geting from indexed real position index, then from this index get position where is target

(view.relPosFromIndex(indexes(temp\_index)))

}

else

{

(XY(0,1))

}

}

// a\* path finding algorithm

def aStarPathfind(cells: String, startingPoint: XY, view: View, destination: XY, bot: Bot, weights: Array[Double]) = {

var open\_list = ListBuffer[XY]() // list where coordinates are added after it selected

var open\_list\_f = ListBuffer[Double]() // list where coordinates weight is added after selection

// open lists are constantly changing because this is temporary lis for value saving

var closed\_list = ListBuffer[Boolean]() // boolean list for checking if coordinates is used

var parent = ListBuffer[Int]() // previous index list for ex. parent(child index) = parent index

var parent\_coordinates = ListBuffer[XY]() // previous coordinates list for ex. parent(child index) = parent coordinates

var g = ListBuffer[Float]() // g weight list for finding path. g is distance fom center to other move pair

var f = ListBuffer[Float]() // g + h weight list for finding path

var h = ListBuffer[Float]() // h weight list for finding path. h is distance between last and other position pair

var foundDest = false // boolean for returning if destination is found

var loopingPos = startingPoint; // current position

var path = ListBuffer[XY]() // founded path coordinates

var path\_index = ListBuffer[Int]() // first coordinates index of path list

// init of lists

for(i <- 0 until cells.length)

{

closed\_list = closed\_list :+ false

parent = parent :+ -1

parent\_coordinates = parent\_coordinates :+ XY(-1,-1)

g = g :+ Float.MaxValue

f = f :+ Float.MaxValue

h = h :+ Float.MaxValue

}

//bot.log(cells.size.toString)

// setuping first element

var index = view.indexFromRelPos(startingPoint)

f.update(index, (0.0).toFloat)

g.update(index, (0.0).toFloat)

h.update(index, (0.0).toFloat)

parent.update(index, index)

parent\_coordinates.update(index, startingPoint)

open\_list = open\_list :+ startingPoint

open\_list\_f = open\_list\_f :+ 0.0

var count = 0

// breakable ussage for breaking while when end is found

breakable{

while(!open\_list.isEmpty)

{

// get element from temporary list and the delete it

loopingPos = open\_list(0)

var parentIndex = view.indexFromRelPos(loopingPos)

open\_list.remove(0)

open\_list\_f.remove(0)

// set that position is visited

closed\_list.update(index, false)

// checking neighbours around selected element for finding next element

for(x <- -1 to 1)

{

for(y <- -1 to 1)

{

// prevent form adding zero coordinates

if((x != 0 && y != 0) ||(x == 0 && y != 0) || (x != 0 && y == 0))

{

var pos = loopingPos + XY(x, y)

index = view.indexFromRelPos(pos)

if (!view.outOfBoundsRel(pos))

{

// destination found

if(pos == destination)

{

// add last coordinates and index

parent\_coordinates.update(index, pos)

parent.update(index, parentIndex)

// trace path

var (temp\_path, temp\_path\_index) = tracePath(parent, parent\_coordinates, pos, startingPoint, view, bot)

path = temp\_path

path\_index = temp\_path\_index

foundDest = true

break

}

else if(closed\_list(index) == false && isUnBlocked(cells, index)) // check if element is not blocked and coordinates ins not used

{

// calculate vaerage weight around new element. this helps decide new coordinates with geat map

var average\_weight = 0.0

var count = 0

for(x\_tmp <- -1 to 1)

{

for(y\_tmp <- -1 to 1)

{

var temp\_pos = pos + XY(x\_tmp, y\_tmp)

if(!bot.view.outOfBoundsRel(temp\_pos))

{

var temp\_index = view.indexFromRelPos(pos)

average\_weight = average\_weight + weights(temp\_index)

average\_weight += weights(index)

count += 1

}

}

}

average\_weight = average\_weight / count

// calculating weight for coordinates

var gNew = 0.0

if((x == 0 && y != 0) || (x != 0 && y == 0))

{

gNew = g(parentIndex) + 1.0;

}

else

{

gNew = g(parentIndex) + 1.414;

}

gNew = gNew

var hNew = calculateHValue(pos, destination)

hNew = hNew

var fNew = gNew + hNew + average\_weight;

// check if use this coordinates or more efficent coordinates is already selected

if (f(index) == Float.MaxValue || f(index) > fNew)

{

// add new coordinates for next coordinates

open\_list = open\_list :+ pos

open\_list\_f = open\_list\_f :+ fNew

//bot.log(index.toString)

// update all values fom init to real values

f.update(index, fNew.toFloat)

g.update(index, gNew.toFloat)

h.update(index, hNew.toFloat)

parent.update(index, parentIndex)

parent\_coordinates.update(index, loopingPos)

}

}

}

}

}

}

}

}

(path, path\_index, foundDest)

}

def isUnBlocked(colums: String, index\_check: Int): (Boolean) =

{

// Returns true if the cell is not blocked else false

if (colums(index\_check) != 'w' && colums(index\_check) != '?' && colums(index\_check) != 'b')

{

(true)

}

else

{

(false)

}

}

def calculateHValue(pos: XY, dest: XY): (Double)=

{

// Return using the distance formula

(sqrt((pos.x-dest.x)\*(pos.x-dest.x) + (pos.y-dest.y)\*(pos.y-dest.y)))

}

def tracePath(parent: ListBuffer[Int], parent\_coordinates: ListBuffer[XY], last: XY, dest: XY, view: View, bot: Bot) = {

// go from back to beggining and return reversed list as path

var Path = ListBuffer[XY]()

var index = view.indexFromRelPos(last)

var indexGo = ListBuffer[Int]()

while(parent(index) != view.indexFromRelPos(dest))

{

Path = parent\_coordinates(index) +=: Path

indexGo = index +=: indexGo

index = parent(index)

}

Path = parent\_coordinates(index) +=: Path

indexGo = index +=: indexGo

(Path, indexGo)

}

// almoust the same as master bot changed target search

def analyzeViewAsBot(bot: Bot, masterVal: Int) = {

var view = bot.view

val directionValue = Array.ofDim[Double](8)

var nearestEnemyMaster: XY = XY(0,0)

var nearestEnemySlave: XY = XY(0,0)

var nearestEnemy: XY = XY(0,0)

var nearestEnemyIndex: Int = 0

var nearestDistance: Int = 0

val cells = view.cells

val cellCount = cells.length

val cellWeights = Array.ofDim[Double](cellCount)

val indexRel = view.indexFromRelPos(XY(0,0))

// this for creates heatmap for helping a\* algorith find road to position with weight. When heatmap ia updating closest enemy is updating too

for(i <- 0 until cellCount) {

val cellRelPos = view.relPosFromIndex(i)

if(cellRelPos.isNonZero && !view.outOfBoundsRel(cellRelPos)) {

cells(i) match {

case 'M' =>

cellWeights(i) += 1500000

case 'm' => // another master: not dangerous, but an obstacle

nearestEnemyMaster = cellRelPos

if(!bot.view.outOfBoundsRel(cellRelPos))

{

for (x <- -4 to 4) {

for (y <- -4 to 4) {

val pos = cellRelPos + XY(x, y)

val stepDistance = cellRelPos.stepsTo(pos)

if (pos.isNonZero && !view.outOfBoundsRel(pos) && stepDistance != 0) {

cellWeights(view.indexFromRelPos(pos)) += 10000

}

}

}

}

nearestEnemy = nearestEnemyMaster

nearestEnemyIndex = i

nearestDistance = cellRelPos.stepCount

case 's' => // another slave: potentially dangerous?

nearestEnemySlave = cellRelPos

for (j <- 0 until cellCount) {

val pos = view.relPosFromIndex(j)

if(!bot.view.outOfBoundsRel(pos))

{

val stepDistance = cellRelPos.stepsTo(pos)

if (pos.isNonZero && !view.outOfBoundsRel(pos) && stepDistance != 0) {

val stepDistance = cellRelPos.stepsTo(pos)

cellWeights(j) += 1000 / stepDistance

}

}

}

if(nearestDistance > cellRelPos.stepCount)

{

nearestEnemy = nearestEnemySlave

nearestEnemyIndex = i

}

case 'P' =>

val pos = view.relPosFromIndex(i)

val stepDistance = cellRelPos.stepsTo(pos)

if(pos.isNonZero && !view.outOfBoundsRel(pos) && stepDistance != 0)

{

if (stepDistance == 1) cellWeights(i) += 100

else if (stepDistance == 2) cellWeights(i) += 300

else cellWeights(i) += 500

}

case 'B' =>

val pos = view.relPosFromIndex(i)

val stepDistance = cellRelPos.stepsTo(pos)

if (stepDistance == 1) cellWeights(i) += 50

else if (stepDistance == 2) cellWeights(i) += 200

else cellWeights(i) += 520

case 'b' =>

for (x <- -2 to 2) {

for (y <- -2 to 2) {

val pos = view.relPosFromIndex(i) + XY(x,y)

val stepDistance = cellRelPos.stepsTo(pos)

if(pos.isNonZero && !view.outOfBoundsRel(pos) && stepDistance != 0)

{

val index = view.indexFromRelPos(pos)

cellWeights(index) += 2500000

}

}

}

/\*case 'p' => // bad plant: bad, but only if I step on it

cellWeights(i) += 100000\*/

case 'W' => // wall: harmless, just don't walk into it

for (x <- -1 to 1) {

for (y <- -1 to 1) {

val pos = cellRelPos + XY(x, y)

val stepDistance = cellRelPos.stepsTo(pos)

if(pos.isNonZero && !view.outOfBoundsRel(pos) && stepDistance != 0)

{

cellWeights(view.indexFromRelPos(pos)) += 1500000

}

}

}

case '?' =>

cellWeights(i) += 1500000

case '\_' =>

cellWeights(i) += 2

case \_ => cellWeights(i) += 1

}

}

}

var direction45 = 0

val lastDirection = bot.inputAsIntOrElse("lastDirection", 0)

val lastCount = bot.inputAsIntOrElse("lastCount", 0).toInt

val previuosStepCount = bot.inputAsIntOrElse("PreviousStepCount", 0).toInt

if ((cells.contains('m') || cells.contains('s')) || (lastCount < 1 && lastCount > 2)) {

// check if nearest enemy is not at master position

if(!nearestEnemy.isZero)

{

var (path, path\_index, found) = aStarPathfind(cells, XY.Zero, view, nearestEnemy, bot, cellWeights)

if(found && path.size > 0)

{

if(path(path.size - 1) != XY(0,0))

{

if(previuosStepCount == path.size)

{

bot.set("lastCount" -> 1.toString)

}

bot.set("PreviousStepCount" -> path.size)

direction45 = path(path.size - 1).toDirection45

bot.log(direction45.toString)

directionValue(direction45)

}

}

else

{

bot.set("lastCount" -> 1.toString)

}

}

else{

// check if enemy is still in view

if(!bot.view.outOfBoundsRel(nearestEnemy) && !nearestEnemy.isZero)

{

// update weights after enemy is at master position

var index\_tmp = view.indexFromRelPos(nearestEnemy)

cellWeights(index\_tmp) += cellWeights(index\_tmp) \* 2

// search for path

var (path, path\_index, found) = aStarPathfind(cells, XY.Zero, view, nearestEnemy, bot, cellWeights)

if(found && path.size > 0)

{

if(path(path.size - 1) != XY(0,0))

{

if(previuosStepCount == path.size)

{

bot.set("lastCount" -> 1.toString)

}

bot.set("PreviousStepCount" -> path.size)

direction45 = path(path.size - 1).toDirection45

bot.log(direction45.toString)

directionValue(direction45)

}

}

else

{

bot.set("lastCount" -> 1.toString)

}

}

}

}

else if((!cells.contains('m') && !cells.contains('s')) || (lastCount > 0 && lastCount < 3)) // use refrence algorithm if enemy is not in view or path by a\* is not found

{

for(i <- 0 until cellCount) {

val cellRelPos = view.relPosFromIndex(i)

if(cellRelPos.isNonZero && !view.outOfBoundsRel(cellRelPos)) {

val stepDistance = cellRelPos.stepCount

val value: Double = cells(i) match {

case 'm' =>

700

case 's' => // another slave: potentially dangerous?

700 / stepDistance

case 'S' => // out own slave

0.0

case 'B' => // good beast: valuable, but runs away

if(stepDistance == 1) -600

else if(stepDistance == 2) -300

else -(150 - stepDistance \* 15).max(10)

case 'P' => // good plant: less valuable, but does not run

if(stepDistance == 1) -500

else if(stepDistance == 2) -00

else -(150 - stepDistance \* 10).max(10)

case 'b' => // bad beast: dangerous, but only if very close

if(stepDistance < 4) -400 / stepDistance else -50 / stepDistance

case 'p' => // bad plant: bad, but only if I step on it

if(stepDistance < 2) -1000 else 0

case 'W' => // wall: harmless, just don't walk into it

if(stepDistance < 3) -1000 else 0

case '?' =>

-1000

case '\_' => 10

case \_ => 0.0

}

direction45 = cellRelPos.toDirection45

directionValue(direction45) += value

val bestDirection45 = directionValue.zipWithIndex.maxBy(\_.\_1).\_2

direction45 = bestDirection45

}

}

}

(direction45)

}

// almoust the same as master bot target changes if harvest bot have 1500 energy adn is vissable by bot

def analyzeViewAsHarvest(bot: Bot) = {

var view = bot.view

// cia suranda vieta kur eiti

val directionValue = Array.ofDim[Double](8)

var nearestEnemyMaster: Option[XY] = None

var nearestEnemySlave: Option[XY] = None

var nearestMaster: XY = XY(0,0)

val cells = view.cells

val cellCount = cells.length

val cellWeights = Array.ofDim[Double](cellCount)

val indexRel = view.indexFromRelPos(XY(0,0))

// heat map

for(i <- 0 until cellCount) {

val cellRelPos = view.relPosFromIndex(i)

if(cellRelPos.isNonZero && !view.outOfBoundsRel(cellRelPos)) {

cells(i) match {

case 'M' =>

nearestMaster = cellRelPos

case 'm' =>

nearestEnemyMaster = Some(cellRelPos)

for (x <- -4 to 4) {

for (y <- -4 to 4) {

val pos = cellRelPos + XY(x, y)

if (pos.isNonZero && !view.outOfBoundsRel(pos)) {

cellWeights(view.indexFromRelPos(pos)) += 10000

}

}

}

case 's' =>

nearestEnemySlave = Some(cellRelPos)

for (j <- 0 until cellCount) {

val pos = view.relPosFromIndex(j)

if(!bot.view.outOfBoundsRel(pos))

{

val stepDistance = cellRelPos.stepsTo(pos)

if (pos.isNonZero && stepDistance != 0) {

val stepDistance = cellRelPos.stepsTo(pos)

cellWeights(j) += 1000 / stepDistance

}

}

}

case 'P' =>

val pos = view.relPosFromIndex(i)

if(!bot.view.outOfBoundsRel(pos))

{

val stepDistance = cellRelPos.stepsTo(pos)

if (stepDistance == 1) cellWeights(i) += 100

else if (stepDistance == 2) cellWeights(i) += 300

else cellWeights(i) += 500

}

case 'B' =>

val pos = view.relPosFromIndex(i)

val stepDistance = cellRelPos.stepsTo(pos)

if (stepDistance == 1) cellWeights(i) += 50

else if (stepDistance == 2) cellWeights(i) += 200

else cellWeights(i) += 520

case 'b' =>

for (x <- -2 to 2) {

for (y <- -2 to 2) {

val pos = view.relPosFromIndex(i) + XY(x,y)

if(pos.isNonZero && !view.outOfBoundsRel(pos))

{

val index = view.indexFromRelPos(pos)

cellWeights(index) += 2500000

}

}

}

case 'W' => // wall: harmless, just don't walk into it

for (x <- -1 to 1) {

for (y <- -1 to 1) {

val pos = cellRelPos + XY(x, y)

if (pos.isNonZero && !view.outOfBoundsRel(pos)) {

cellWeights(view.indexFromRelPos(pos)) += 1500000

}

}

}

case '?' =>

cellWeights(i) += 1500000

case '\_' =>

cellWeights(i) += 2

case \_ => cellWeights(i) += 1

}

}

}

var direction45 = 0

val lastDirection = bot.inputAsIntOrElse("lastDirection", 0)

val lastCount = bot.inputAsIntOrElse("lastCount", 0).toInt

val previuosStepCount = bot.inputAsIntOrElse("PreviousStepCount", 0).toInt

if ((cells.contains('P') || cells.contains('B') || (cells.contains('M') && bot.energy > 1500)) || (lastCount < 1 && lastCount > 2)) {

var (closestFood) = findClosestThings(cellCount, cells, view, cellWeights, bot)

if(cells.contains('M') && bot.energy > 1500)

{

closestFood = nearestMaster

}

if(!closestFood.isZero)

{

var (path, path\_index, found) = aStarPathfind(cells, XY.Zero, view, closestFood, bot, cellWeights)

if(found && path.size > 0)

{

if(path(path.size - 1) != XY(0,0))

{

if(previuosStepCount == path.size)

{

bot.set("lastCount" -> 1.toString)

}

bot.set("PreviousStepCount" -> path.size)

direction45 = path(path.size - 1).toDirection45

bot.log(direction45.toString)

directionValue(direction45)

}

}

else

{

bot.set("lastCount" -> 1.toString)

}

}

else{

var (temp\_closestFood) = findClosestThings(cellCount, cells, view, cellWeights, bot)

if(cells.contains('M') && bot.energy > 1500)

{

var closestFood = nearestMaster

var (path, path\_index, found) = aStarPathfind(cells, XY.Zero, view, closestFood, bot, cellWeights)

if(found && path.size > 0)

{

if(path(path.size - 1) != XY(0,0))

{

if(previuosStepCount == path.size)

{

bot.set("lastCount" -> 1.toString)

}

bot.set("PreviousStepCount" -> path.size)

direction45 = path(path.size - 1).toDirection45

bot.log(direction45.toString)

directionValue(direction45)

}

}

else

{

bot.set("lastCount" -> 1.toString)

}

}

else

{

if(!bot.view.outOfBoundsRel(temp\_closestFood) && !temp\_closestFood.isZero)

{

var index\_tmp = view.indexFromRelPos(temp\_closestFood)

cellWeights(index\_tmp) += cellWeights(index\_tmp) \* 2

var (closestFood) = findClosestThings(cellCount, cells, view, cellWeights, bot)

var (path, path\_index, found) = aStarPathfind(cells, XY.Zero, view, closestFood, bot, cellWeights)

if(found && path.size > 0)

{

if(path(path.size - 1) != XY(0,0))

{

if(previuosStepCount == path.size)

{

bot.set("lastCount" -> 1.toString)

}

bot.set("PreviousStepCount" -> path.size)

direction45 = path(path.size - 1).toDirection45

bot.log(direction45.toString)

directionValue(direction45)

}

}

else

{

bot.set("lastCount" -> 1.toString)

}

}

}

}

}

else if((!cells.contains('P') && !cells.contains('B') && !cells.contains('M')) || (lastCount > 0 && lastCount < 3))

{

for(i <- 0 until cellCount) {

val cellRelPos = view.relPosFromIndex(i)

if(cellRelPos.isNonZero && !view.outOfBoundsRel(cellRelPos)) {

val stepDistance = cellRelPos.stepCount

val value: Double = cells(i) match {

case 'M' =>

1500000

case 'm' => // another master: not dangerous, but an obstacle

nearestEnemyMaster = Some(cellRelPos)

if(stepDistance < 2) -1000 else 0

case 's' => // another slave: potentially dangerous?

nearestEnemySlave = Some(cellRelPos)

-100 / stepDistance

case 'S' => // out own slave

0.0

case 'B' => // good beast: valuable, but runs away

if(stepDistance == 1) 600

else if(stepDistance == 2) 300

else (150 - stepDistance \* 15).max(10)

case 'P' => // good plant: less valuable, but does not run

if(stepDistance == 1) 500

else if(stepDistance == 2) 300

else (150 - stepDistance \* 10).max(10)

case 'b' => // bad beast: dangerous, but only if very close

if(stepDistance < 4) -400 / stepDistance else -50 / stepDistance

case 'p' => // bad plant: bad, but only if I step on it

if(stepDistance < 2) -1000 else 0

case 'W' => // wall: harmless, just don't walk into it

if(stepDistance < 3) -1000 else 0

case '?' =>

-1000

case '\_' => 10

case \_ => 0.0

}

direction45 = cellRelPos.toDirection45

directionValue(direction45) += value

val bestDirection45 = directionValue.zipWithIndex.maxBy(\_.\_1).\_2

direction45 = bestDirection45

}

}

bot.set("lastCount" -> (lastCount + 1).toString)

}

(direction45)

}

}

// -------------------------------------------------------------------------------------------------

// Framework

// -------------------------------------------------------------------------------------------------

class ControlFunctionFactory {

def create = (input: String) => {

val (opcode, params) = CommandParser(input)

opcode match {

case "React" =>

val bot = new BotImpl(params)

if( bot.generation == 0 ) {

ControlFunction.forMaster(bot)

} else {

ControlFunction.forSlave(bot)

}

bot.toString

case \_ => "" // OK

}

}

}

// -------------------------------------------------------------------------------------------------

trait Bot {

// inputs

def inputOrElse(key: String, fallback: String): String

def inputAsIntOrElse(key: String, fallback: Int): Int

def inputAsXYOrElse(keyPrefix: String, fallback: XY): XY

def view: View

def energy: Int

def time: Int

def generation: Int

// outputs

def move(delta: XY) : Bot

def say(text: String) : Bot

def status(text: String) : Bot

def spawn(offset: XY, params: (String,Any)\*) : Bot

def set(params: (String,Any)\*) : Bot

def log(text: String) : Bot

}

trait MiniBot extends Bot {

// inputs

def offsetToMaster: XY

// outputs

def explode(blastRadius: Int) : Bot

}

case class BotImpl(inputParams: Map[String, String]) extends MiniBot {

// input

def inputOrElse(key: String, fallback: String) = inputParams.getOrElse(key, fallback)

def inputAsIntOrElse(key: String, fallback: Int) = inputParams.get(key).map(\_.toInt).getOrElse(fallback)

def inputAsXYOrElse(key: String, fallback: XY) = inputParams.get(key).map(s => XY(s)).getOrElse(fallback)

val view = View(inputParams("view"))

val energy = inputParams("energy").toInt

val time = inputParams("time").toInt

val generation = inputParams("generation").toInt

def offsetToMaster = inputAsXYOrElse("master", XY.Zero)

// output

private var stateParams = Map.empty[String,Any] // holds "Set()" commands

private var commands = "" // holds all other commands

private var debugOutput = "" // holds all "Log()" output

/\*\* Appends a new command to the command string; returns 'this' for fluent API. \*/

private def append(s: String) : Bot = { commands += (if(commands.isEmpty) s else "|" + s); this }

/\*\* Renders commands and stateParams into a control function return string. \*/

override def toString = {

var result = commands

if(!stateParams.isEmpty) {

if(!result.isEmpty) result += "|"

result += stateParams.map(e => e.\_1 + "=" + e.\_2).mkString("Set(",",",")")

}

if(!debugOutput.isEmpty) {

if(!result.isEmpty) result += "|"

result += "Log(text=" + debugOutput + ")"

}

result

}

def log(text: String) = { debugOutput += text + "\n"; this }

def move(direction: XY) = append("Move(direction=" + direction + ")")

def say(text: String) = append("Say(text=" + text + ")")

def status(text: String) = append("Status(text=" + text + ")")

def explode(blastRadius: Int) = append("Explode(size=" + blastRadius + ")")

def spawn(offset: XY, params: (String,Any)\*) =

append("Spawn(direction=" + offset +

(if(params.isEmpty) "" else "," + params.map(e => e.\_1 + "=" + e.\_2).mkString(",")) +

")")

def set(params: (String,Any)\*) = { stateParams ++= params; this }

def set(keyPrefix: String, xy: XY) = { stateParams ++= List(keyPrefix+"x" -> xy.x, keyPrefix+"y" -> xy.y); this }

}

// -------------------------------------------------------------------------------------------------

/\*\* Utility methods for parsing strings containing a single command of the format

\* "Command(key=value,key=value,...)"

\*/

object CommandParser {

/\*\* "Command(..)" => ("Command", Map( ("key" -> "value"), ("key" -> "value"), ..}) \*/

def apply(command: String): (String, Map[String, String]) = {

/\*\* "key=value" => ("key","value") \*/

def splitParameterIntoKeyValue(param: String): (String, String) = {

val segments = param.split('=')

(segments(0), if(segments.length>=2) segments(1) else "")

}

val segments = command.split('(')

if( segments.length != 2 )

throw new IllegalStateException("invalid command: " + command)

val opcode = segments(0)

val params = segments(1).dropRight(1).split(',')

val keyValuePairs = params.map(splitParameterIntoKeyValue).toMap

(opcode, keyValuePairs)

}

}

// -------------------------------------------------------------------------------------------------

/\*\* Utility class for managing 2D cell coordinates.

\* The coordinate (0,0) corresponds to the top-left corner of the arena on screen.

\* The direction (1,-1) points right and up.

\*/

case class XY(x: Int, y: Int) {

override def toString = x + ":" + y

def isNonZero = x != 0 || y != 0

def isZero = x == 0 && y == 0

def isNonNegative = x >= 0 && y >= 0

def updateX(newX: Int) = XY(newX, y)

def updateY(newY: Int) = XY(x, newY)

def addToX(dx: Int) = XY(x + dx, y)

def addToY(dy: Int) = XY(x, y + dy)

def +(pos: XY) = XY(x + pos.x, y + pos.y)

def -(pos: XY) = XY(x - pos.x, y - pos.y)

def \*(factor: Double) = XY((x \* factor).intValue, (y \* factor).intValue)

def distanceTo(pos: XY): Double = (this - pos).length // Phythagorean

def length: Double = math.sqrt(x \* x + y \* y) // Phythagorean

def stepsTo(pos: XY): Int = (this - pos).stepCount // steps to reach pos: max delta X or Y

def stepCount: Int = x.abs.max(y.abs) // steps from (0,0) to get here: max X or Y

def signum = XY(x.signum, y.signum)

def negate = XY(-x, -y)

def negateX = XY(-x, y)

def negateY = XY(x, -y)

/\*\* Returns the direction index with 'Right' being index 0, then clockwise in 45 degree steps. \*/

def toDirection45: Int = {

val unit = signum

unit.x match {

case -1 =>

unit.y match {

case -1 =>

if(x < y \* 3) Direction45.Left

else if(y < x \* 3) Direction45.Up

else Direction45.UpLeft

case 0 =>

Direction45.Left

case 1 =>

if(-x > y \* 3) Direction45.Left

else if(y > -x \* 3) Direction45.Down

else Direction45.LeftDown

}

case 0 =>

unit.y match {

case 1 => Direction45.Down

case 0 => throw new IllegalArgumentException("cannot compute direction index for (0,0)")

case -1 => Direction45.Up

}

case 1 =>

unit.y match {

case -1 =>

if(x > -y \* 3) Direction45.Right

else if(-y > x \* 3) Direction45.Up

else Direction45.RightUp

case 0 =>

Direction45.Right

case 1 =>

if(x > y \* 3) Direction45.Right

else if(y > x \* 3) Direction45.Down

else Direction45.DownRight

}

}

}

def rotateCounterClockwise45 = XY.fromDirection45((signum.toDirection45 + 1) % 8)

def rotateCounterClockwise90 = XY.fromDirection45((signum.toDirection45 + 2) % 8)

def rotateClockwise45 = XY.fromDirection45((signum.toDirection45 + 7) % 8)

def rotateClockwise90 = XY.fromDirection45((signum.toDirection45 + 6) % 8)

def wrap(boardSize: XY) = {

val fixedX = if(x < 0) boardSize.x + x else if(x >= boardSize.x) x - boardSize.x else x

val fixedY = if(y < 0) boardSize.y + y else if(y >= boardSize.y) y - boardSize.y else y

if(fixedX != x || fixedY != y) XY(fixedX, fixedY) else this

}

}

object XY {

/\*\* Parse an XY value from XY.toString format, e.g. "2:3". \*/

def apply(s: String) : XY = { val a = s.split(':'); XY(a(0).toInt,a(1).toInt) }

val Zero = XY(0, 0)

val One = XY(1, 1)

val Right = XY( 1, 0)

val RightUp = XY( 1, -1)

val Up = XY( 0, -1)

val UpLeft = XY(-1, -1)

val Left = XY(-1, 0)

val LeftDown = XY(-1, 1)

val Down = XY( 0, 1)

val DownRight = XY( 1, 1)

def fromDirection45(index: Int): XY = index match {

case Direction45.Right => Right

case Direction45.RightUp => RightUp

case Direction45.Up => Up

case Direction45.UpLeft => UpLeft

case Direction45.Left => Left

case Direction45.LeftDown => LeftDown

case Direction45.Down => Down

case Direction45.DownRight => DownRight

}

def fromDirection90(index: Int): XY = index match {

case Direction90.Right => Right

case Direction90.Up => Up

case Direction90.Left => Left

case Direction90.Down => Down

}

def apply(array: Array[Int]): XY = XY(array(0), array(1))

}

object Direction45 {

val Right = 0

val RightUp = 1

val Up = 2

val UpLeft = 3

val Left = 4

val LeftDown = 5

val Down = 6

val DownRight = 7

}

object Direction90 {

val Right = 0

val Up = 1

val Left = 2

val Down = 3

}

// -------------------------------------------------------------------------------------------------

case class View(cells: String) {

val size = math.sqrt(cells.length).toInt

val center = XY(size / 2, size / 2)

val cellCount = cells.length

def apply(relPos: XY) = cellAtRelPos(relPos)

def indexFromAbsPos(absPos: XY) = absPos.x + absPos.y \* size

def absPosFromIndex(index: Int) = XY(index % size, index / size)

def absPosFromRelPos(relPos: XY) = relPos + center

def cellAtAbsPos(absPos: XY) = cells.charAt(indexFromAbsPos(absPos))

def indexFromRelPos(relPos: XY) = indexFromAbsPos(absPosFromRelPos(relPos))

def relPosFromAbsPos(absPos: XY) = absPos - center

def relPosFromIndex(index: Int) = relPosFromAbsPos(absPosFromIndex(index))

def cellAtRelPos(relPos: XY) = cells.charAt(indexFromRelPos(relPos))

def offsetToNearest(c: Char) = {

val matchingXY = cells.view.zipWithIndex.filter(\_.\_1 == c)

if( matchingXY.isEmpty )

None

else {

val nearest = matchingXY.map(p => relPosFromIndex(p.\_2)).minBy(\_.length)

Some(nearest)

}

}

def outOfBoundsRel(relPos: XY) = {

if(math.abs(relPos.x) > center.x || math.abs(relPos.y) > center.y){

true

}

else{

false

}

}

def outOfBoundsAbs(absPos: XY) = {

if(absPos.x < 0 || absPos.x > (size-1) || absPos.y < 0 || absPos.y > (size-1)){

true

}

else{

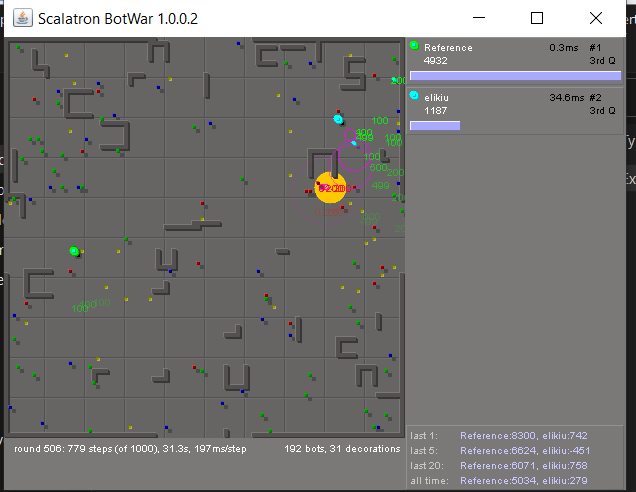
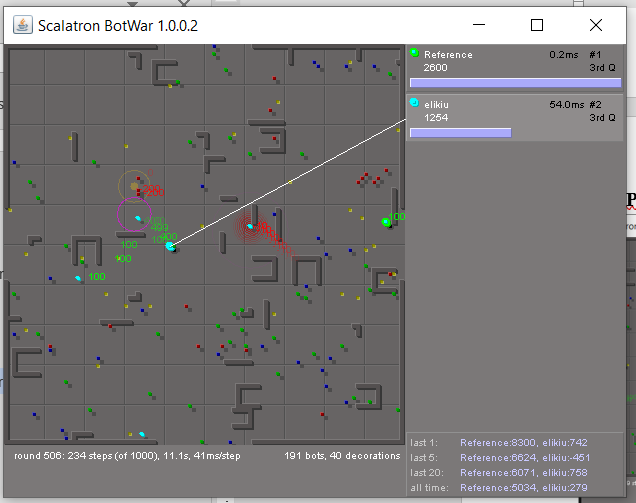
false

}

}

}

## Pardiniai duomenys ir rezultatai

# Haskell (L3)

## Darbo užduotis

**713 Adding Reversed Numbers**

The Antique Comedians of Malidinesia prefer comedies to tragedies. Unfortunately, most of the ancient plays are tragedies. Therefore the dramatic advisor of ACM has decided to transfigure some tragedies into comedies. Obviously, this work is very hard because the basic sense of the play must be kept intact, although all the things change to their opposites. For example the numbers: if any number appears in the tragedy, it must be converted to its reversed form before being accepted into the comedy play.

Reversed number is a number written in arabic numerals but the order of digits is reversed. The first digit becomes last and vice versa. For example, if the main hero had 1245 strawberries in the tragedy, he has 5421 of them now. Note that all the leading zeros are omitted. That means if the number ends with a zero, the zero is lost by reversing (e.g. 1200 gives 21). Also note that the reversed number never has any trailing zeros.

ACM needs to calculate with reversed numbers. Your task is to add two reversed numbers and output their reversed sum. Of course, the result is not unique because any particular number is a reversed form of several numbers (e.g. 21 could be 12, 120 or 1200 before reversing). Thus we must assume that no zeros were lost by reversing (e.g. assume that the original number was 12).

**Input**

The input consists of N cases. The first line of the input contains only positive integer N. Then follow the cases. Each case consists of exactly one line with two positive integers separated by space. These are the reversed numbers you are to add. Numbers will be at most 200 characters long.

**Output**

For each case, print exactly one line containing only one integer — the reversed sum of two reversed numbers. Omit any leading zeros in the output.

**Sample Input**

3

24 1

4358 754

305 794

**Sample Output**

34

1998

1

## Programos tekstas

**module Main where  
import System**.**IO  
import Data**.**Data  
import Data**.**List  
import Text**.**Read***-- remove elements from list from 0 to n*removeEle :: **Int** -> [a] -> [a]  
removeEle n xs  
 *|* (n <= 0) || null xs *=* xs  
 *|* otherwise *=* removeEle (n - 1) (tail xs)  
  
*-- map for checking if elementi is selected type*mapMaybe :: (a -> **Maybe** b) -> [a] -> [b]  
mapMaybe **\_** [] *=* []  
  
mapMaybe f (x:xs) *=* **case** f x **of  
 Just** y -> y : mapMaybe f xs  
 **Nothing** -> mapMaybe f xs  
  
*-- get file handle with selected name*getFileHandle:: **String** -> **IO Handle**getFileHandle name *=* openFile name **ReadMode***-- append results to selected file recursively*writeLines fileName list listOriginalLength *=* **do** notEnd ((length list) > 0)  
 **where** notEnd **True** *=* **do** file <- openFile fileName **AppendMode** hPutStrLn file ( show (head list))  
 hClose file  
 writeLines fileName (removeEle 1 list) listOriginalLength  
  
*-- read lines from file while file is not at end*getLines :: **Handle** -> **IO** [**String**]  
getLines hndl *=* **do** eof <- hIsEOF hndl  
 notEnded eof  
 **where** notEnded **False** *=* **do  
 let** line *=* hGetLine hndl  
 lineConverted <- line  
 rest <- getLines hndl  
 return (lineConverted:rest)  
 notEnded **True** *=* return []  
  
  
*-- split lines as words*getArray :: [**String**] -> **IO** [[**String**]]  
getArray list *=* **do** notEnded (length list > 0)  
 **where** notEnded **True** *=* **do  
 let** lineConverted *=* words (head list)  
 **let** firstVal *=* **if** (length lineConverted) > 0 **then** lineConverted !! 0 **else ""  
 let** secondVal *=* **if** (length lineConverted) > 1 **then** lineConverted !! 1 **else ""  
 let** word *=* [firstVal, secondVal]  
 **let** removedEl *=* removeEle 1 list  
 **let** restAnsw *=* getArray removedEl  
 answ <- restAnsw  
 return (word:answ)  
 notEnded **False** *=* return []  
  
*-- reverse element, it works as reversing list*myReverse :: [a] -> [a]  
myReverse [] *=* []  
myReverse (x:xs) *=* (myReverse xs) ++ [x]  
  
  
*-- calculate reverse int sum*calcReverse :: [[**Int**]] -> **IO** [**Int**]  
calcReverse list *=* notEnded ((length list) > 0) *-- condition to work* **where** notEnded **True** *=* **do   
 let** first *=* head list *-- list of elements* **let** forReverseFirst *=* show (first !! 0)  
 **let** forReverseSecond *=* show (first !! 1)  
 **let** firstReverse *=* read (myReverse forReverseFirst) :: **Int** *-- reverse first element and convert to int* **let** secondReverse *=* read (myReverse forReverseSecond) :: **Int** *-- reverse second element and convert to int* **let** sum *=* firstReverse + secondReverse *-- sum of two reverse elements* **let** resReverse *=* read (myReverse $ show sum) :: **Int** *-- reverse answer* **let** datList *=* removeEle 1 list *-- remove one element from list every time until list doesnt have any elements* **let** returnVal *=* calcReverse datList  
 ans <- returnVal  
 return (resReverse:ans) *-- add las value to list* notEnded **False** *=* **do** return []  
  
main :: **IO** ()  
main *=* **do  
 let** myint *=* 1 ::**Int** *--putStrLn "hello world"* file <- getFileHandle **"input.txt"** fileForFirst <- getFileHandle **"input.txt"** *-- reader* lenghtFileLines <- getLines fileForFirst *-- read file for first line* hClose fileForFirst  
 **let** filterLenghtForFirst *=* filter (*\*x -> length x > 0) lenghtFileLines *-- filter first list from emty lines* **let** firstElement *=* words (filterLenghtForFirst !! 0) *-- get first element* **let** lenghtFile *=* **if** (length firstElement == 1) **then** (read (firstElement !! 0) :: **Int**)+1 *-- adding one because we need to delete one value more* **else** -1 *-- checks if first line is length or pair* linesFromFile <- getLines file *-- read lines from file* **let** filterLenght *=* filter (*\*x -> length x > 0) linesFromFile *-- filter all lines for empty lines* **let** reverseList *=* reverse (filterLenght) *-- create reverse list for removing elements by first element if it is given length* **let** lengthRemove *=* (length reverseList) - lenghtFile *-- calculate how many elements need to be removed* **if** lenghtFile > 0 && length reverseList > 0 **then do   
 let** removed *=* removeEle lengthRemove reverseList *-- remove elements from list by calculated elements* **let** reverseBack *=* reverse removed *-- reverse back list for using* **let** stringArray *=* getArray reverseBack  
 array <- stringArray  
 **let** filterForUse *=* map (filter (*\*x -> length x > 0 )) array *-- filtering for empy values* **let** filterForUseSec *=* filter (*\*x -> length x > 1 ) filterForUse *-- filtering for empy arrays* **let** filterInt *=* map ( mapMaybe (*\*x -> readMaybe x :: **Maybe Int**) ) filterForUseSec *-- removing elements that are not numbers* **let** filterForUseThird *=* filter (*\*x -> length x > 1 ) filterInt *-- filtering for empty arrays* **let** answer *=* calcReverse filterForUseThird *-- use calculation function* answ <- answer  
 file <- openFile **"result.txt" WriteMode** *-- creates file if needed* hPutStr file **""** *-- rewrite file with empty value* hClose file *-- close file* writeLines **"result.txt"** answ (length answ) *-- use function for writing answers to file* **else if** lenghtFile <= 0 && length filterLenght > 0 **then do  
 let** stringArray *=* getArray filterLenght  
 array <- stringArray  
 **let** filterForUse *=* map (filter (*\*x -> length x > 0 )) array *-- filtering for empy values* **let** filterForUseSec *=* filter (*\*x -> length x > 1 ) filterForUse *-- filtering for empy arrays* **let** filterInt *=* map ( mapMaybe (*\*x -> readMaybe x :: **Maybe Int**) ) filterForUseSec *-- removing elements that are not numbers* **let** filterForUseThird *=* filter (*\*x -> length x > 1 ) filterInt *-- filtering for empty arrays* **let** answer *=* calcReverse filterForUseThird *-- use calculation function* answ <- answer  
 file <- openFile **"result.txt" WriteMode** *-- creates file if needed* hPutStr file **""** *-- rewrite file with empty value* hClose file *-- close file* writeLines **"result.txt"** answ (length answ) *-- use function for writing answers to file* **else** print **"Error"***-- something <- calculateAnswer linesFromFile  
-- print $ show lenghtFile  
-- check if string can be converted to int*

## Pradiniai duomenys ir rezultatai

|  |  |
| --- | --- |
| Pradiniai duomenys | Rezultatai |
| 3 24 1 4358 754 305 794 | 34 1998 1 |

|  |  |
| --- | --- |
| Pradiniai duomenys | Rezultatai |
| 3 24 1 4358 754 305 794 10 5 10 7a 1 2 10 11 | 34 1998 1 |

|  |  |
| --- | --- |
| Pradiniai duomenys | Rezultatai |
| 7 24 1 4358 754 305 794 10 5 10 7a 1 2 10 11 | 34 1998 1 6 3 21 |

|  |  |
| --- | --- |
| Pradiniai duomenys | Rezultatai |
| 24 1 4358 754 305 794 10 5 10 7a 1 2 10 11 | 34 1998 1 6 3 21 |

|  |  |
| --- | --- |
| Pradiniai duomenys | Rezultatai |
| 24 1 4358 754 305 794 10 5 10 7a 1 2 10 11 | 34 1998 1 6 8 3 21 |

# Prolog

## Darbo užduotis

**Algoritmas:** Sudėti savo gimimo datos skaitmenis tol, kol **suma >= 15**. Pasirinkti užduotis **Nr. suma** ir **Nr. (suma+1)**.

**1998-08-20:**1+9+9+8+0+8+2+0 = **37 >= 15,**todėl**3+7 = 10.**Užduotys:**Nr. 10**ir **Nr. 11**

1. Padidinkite sąrašo elementų skaičių pagal pirmą skaičių, pvz.: [[2, "a"], [3, 1]] -> [["aa"][111]]
2. Patikrinkite ar du skaičiai yra kopirminiai (bendras didžiausias daliklis yra 1)

## Programos tekstas

*% 1998-08-20 uzduotis: 10, 11  
% Eligijus Kiudys IFF-7/14*run\_opt(10) **:-** write(**'Sveiki, prasome iveskite dvieju dimensiju masyva pvz: [[labas, ajai], [antras, 2]]. BUTINAI su tasku gale(.):'**), nl,  
 read(List),  
 listLength(List, Length),  
 listLengthWithSingle(List, LengthAll),  
 write(**'Benras Elementu ilgis neiskaitant vidini sarasa kaip elemento: '**),  
 write(Length), nl,  
 write(**'Benras Elementu ilgis iskaitant vidini sarasa kaip elementa: '**),  
 write(LengthAll), nl.  
  
  
run\_opt(11) **:-** write(**'Sveiki, prasome iveskite dvieju dimensiju masyva pvz: [[2, "a"], [3, 1]] BUTINAI su tasku gale(.):'**), nl,  
 read(List),  
 increasingList(List, Res),  
 write(**'Gautas rezultatu masyvas:'**), nl,  
 write(Res).  
  
run\_opt(**\_**) **:-** write(**'Blogas pasirinkimas'**), nl, halt.  
  
main **:-** write(**'Iveskite uzduoties numeri(10-11) su tasku gale(.):'**), nl,  
 read(Line),  
 run\_opt(Line).  
  
*% task Nr. 10 start*findlen([],X)**:-** *% return zero if list is empty* X=0.  
  
findlen([X|Tail],Count)**:-** *% calculate list length using recurrsion. X is first element, and Tails is all other elements* findlen(Tail,Prev),  
 Count **is** Prev + 1.  
  
listLength([], Lengths) **:-** *% emty list sets length to 0* Lengths=0.  
  
listLength([Head|Tail], Lengths) **:-** *% calculate 2D list lenght without inner list as element using double recurrsion* findlen(Head, Answ), *% inner list lenght* listLength(Tail, LengthsTemp), *% reccursion: inner linght + previuos inner lenght* Lengths **is** LengthsTemp + Answ.  
  
listLengthWithSingle([], Lengths) **:-** *% emty list sets length to 0* Lengths=0.  
  
listLengthWithSingle([Head|Tail], Lengths) **:-** *% calculate 2D list lenght witht inner list as element using double recurrsion* findlen(Head, Answ), *% inner list lenght* TempAnsw **is** Answ + 1, *% adding one for count inner list as elemnt* listLengthWithSingle(Tail, LengthsTemp), *% reccursion: linght + previuos lenght* Lengths **is** LengthsTemp + TempAnsw.  
  
*% task Nr. 10 end  
  
% task Nr. 11 start*firstSecElements([First, Second | Tail], Size, Element) **:-** *% split list into lenght and element for reapiting* Size = First,  
 Element = Second.  
  
genListByElement(**\_**,0,[]) **:-** !. *% end recursive function when count is 0*genListByElement(Element,Count,[Element|Elements]) **:-** *% create list and add same Element to it until count is 0* CountTemp **is** Count-1,  
 genListByElement(Element, CountTemp, Elements).  
  
  
pushFront(Item, List, [Item|List]). *% push element in front of list*genListString(**\_**, **\_**, 0, [34]) **:-** !. *% add " as last element for string creation*genListString([Head|Tail], TempElement, Count, [Head|Elements]) **:-** *% add string element to list as asiic II example: [4], [34, 97] - > [4, 34, 97]* genListString(Tail, TempElement, Count, Elements).  
  
  
genListString(Element, [Head | Tail], Count, Elements) **:-** *% repete adding string all over again when all string elemnts are added until Count is 0* (  
 Element == [] ->  
 CountTemp **is** Count-1,  
 genListString([Head | Tail], [Head | Tail], CountTemp, Elements)  
 ).  
  
generateAtom(TempAnswer, [], Answ) **:-** Answ = TempAnswer.  
  
generateAtom(Atom, [Head | Tail], Answ) **:-** atom\_concat(Atom, Head, TempAnsw),  
 generateAtom(TempAnsw, Tail, Answ).  
  
  
generateDoubleList([ ], Start, Answ) **:-** *% assign answer value* Answ = Start.  
  
generateDoubleList([Head | Tail], Empty, Answ) **:-** firstSecElements(Head, First, Second),  
 (  
 number(Second) -> *% check if element is number* genListByElement(Second, First, List), *% create listh with reapiting elements* TempList = List,  
 append(Empty, [TempList], Value), *% add list to list* generateDoubleList(Tail, Value, Answ) ; *% add elements while array is empty* atom(Second) -> *% check if element is char  
  
 % if atom do this* genListByElement(Second, First, List), *% generate char list* TempList = List,  
 generateAtom(**''**, TempList, Res), *% combine list* append(Empty, [[Res]], Value), *% results append to list* generateDoubleList(Tail, Value, Answ); *% add elements while array is empty  
  
 % if string* genListString(Second, Second, First, List), *% generate asiic II list with " as end* pushFront(34, List, ResultList), *% push to front "* atom\_codes(X, ResultList), *% convert asiic list to atom* append(Empty, [[X]], Value), *% append res to list* generateDoubleList(Tail, Value, Answ) *% add elements while array is empty* ).  
  
increasingList(List, Res) **:-** *% function for returning results* generateDoubleList(List, [], Res).  
  
*% task Nr. 11 end*

## Pradiniai duomenys ir rezultatai

