

Simple Jack - Programmering og Problemløsning

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1 Forord

2 Introduktion

Sådan kompilerer du projektet

I /src mappen ligger der en Makefile og hvis man kører den, kompileres game.exe, begge filer kan findes i mappen /src. Kommandoen til at kompilere er make og kan den kan skrives i terminalen.

Derudover kan man kompilere projektet med dokumentation, ved at bruge kommandoen make withdocs Tests findes i mappen /src, i filen tests.fsx, og kan kompileres med fsharpc og køres med mono.

3 Problemformulering

3.1 Kravspecifikation

4 Problemanalyse og design

Struktur

I dette afsnit vil vi beskrive den strukturelle opbygning vi har overvejet i vores design.

Vores design bygger op omkring fire kerne klasser, Game, Player, Hand og Card og en enumeration kaldet Suits - der huser de fire forskellige kulører. De forskellige klasser skal mimikke fysiske objekter og funktioner der forekommer i spillet.

Game

Game gemmer Player objektet for dealeren, en liste af Player objekter af de spillere der deltager og den nuværende stak der kan trækkes fra - denne stak er af typen Hand. Ved siden af det har den en funktion til at returnere antallet af spillere i spillet, det er i princippet bare en funktion der tager længden af players arrayen. Game indeholder også en funktion draw, der trækker et kort fra stack og ligger den ind i den valgte spillers hånd.

Game objectets funktion er at holde styr på alt det nødvendige for spil logikken, så al datahåndtering til et spil foregår i dette objekt.

Hand

Hand gemmer en array af Card objekter, og skal være et objekt der håndtere den funktion vores hånd har i et normalt kortspil. En hånd har en funktion der trækker et kort, altid det øverste(stak) denne har vi valgt at kalde drop, den har en funktion der ligger et kort på stakken denne hedder draw, så kan hele håndens kort erstattes, hånden skal kunne blandes og hånden skal kunne skrives ud som string.

Player

En spiller/person skal have et navn(name) i følge kravspecifikationen, vi bruger også Playerklassen til AI, så derfor har vi også en bool(AI), index er array indexet for Playeren i Players arrayen, eller hvornår spilleren har tur, og hand er et Hand objekt der indeholder spillerens hånd.

Ved siden af de properties har vi en score funktion der beregner spillens score, ved at gå gennem de kort der er i hånden. En isBusted der beregner om scoren er for høj og en scoreboard, der laver en tekstrepræsentation af spillerens hånd og score.

Card

Et spillekort har en kulør, se Sektionen 4, og en værdi/index der repræsenterer kortet, hvor 11 - 13 er (bonde, dame, konge) og numrene 2 - 10 har deres respektive værdi og et es har værdien 1. Denne værdi må ikke sammenblandes med den værdi kortet har i Blackjack, da alle billedkort har samme værdi - og derfor vil den værdi ikke være unik. Denne value sammenlæd med suit skaber en unik værdi, der kan bruges til at repræsentere kortet når spillepladen vises.

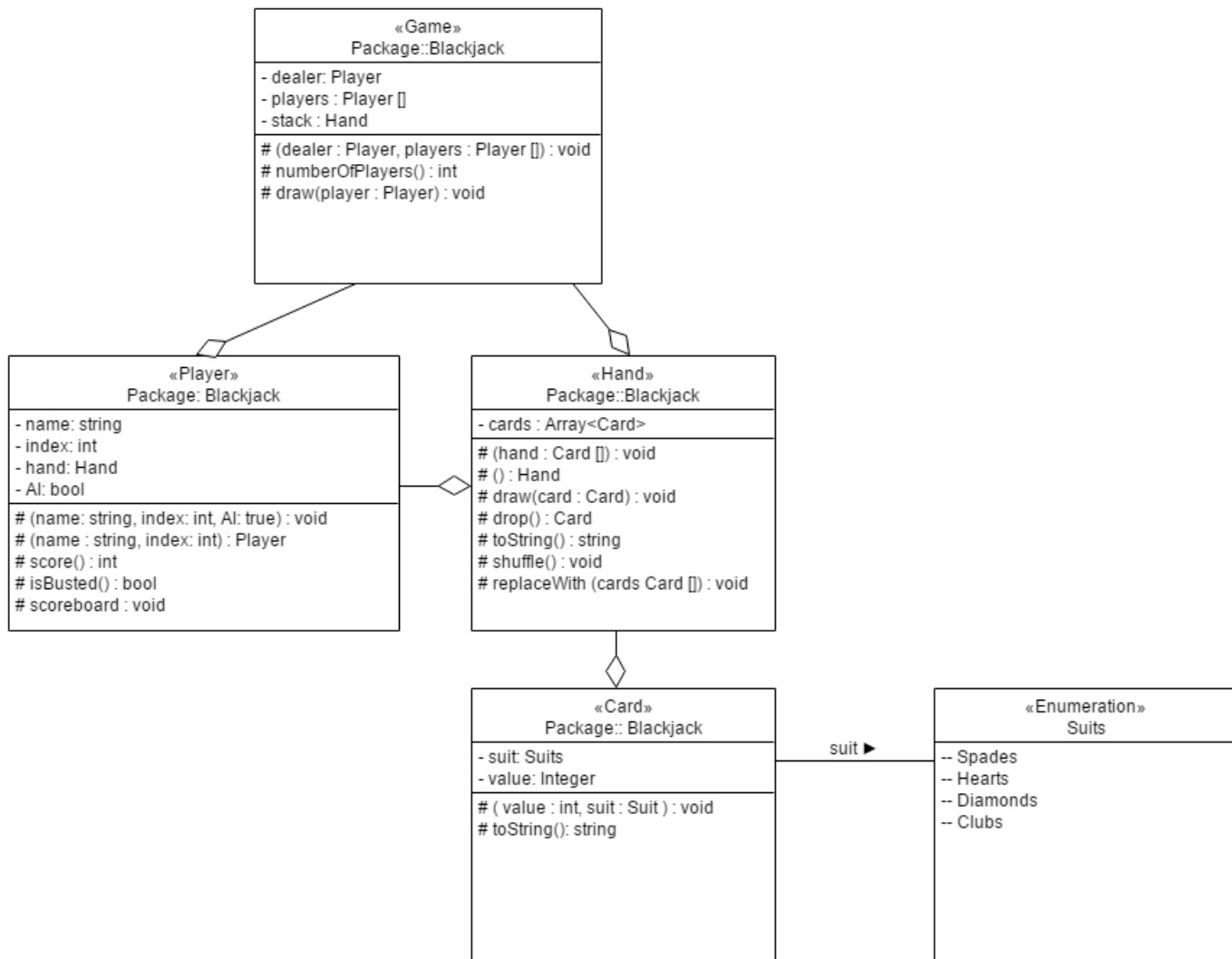
Udover suit og value, har kortet en funktion toString() der returnere en tekstrepræsentation af kortet.

```
member this.toString() =  
    let suit =  
        match this.suit with  
        | Spades -> "spade"  
        | Hearts -> "heart"  
        | Diamonds -> "diamond"  
        | Clubs -> "club"  
    let value =  
        match this.value with  
        | 1 -> "A"  
        | 11 -> "J"  
        | 12 -> "Q"  
        | 13 -> "K"  
        | x -> sprintf "%d" x  
    sprintf "%s%s" suit value
```

Listing 1: Card's toString metode

Suits

En enumeration er, specielt i OOP, en god måde at repræsentere forskellige værdier for det samme field, når der kun er de mulige værdier for et field. I vores tilfælde, med Card.suit, har vi kun de fire værdier og derfor ift validering, struktur m.m valgte vi at bruge en enumeration.



Figur 1: UML diagram over vores klasse implementation

5 Programbeskrivelse

6 Afprøvning

7 Diskussion og konklusion

8 Bilag

8.1 Brugervejledning

8.2 Kildekode

```
// Console helperfunctions
let write (str:string) = System.Console.Write str
let writeln (str:string) = System.Console.WriteLine str
let readln () = System.Console.ReadLine()
let setcursor(x,y) = System.Console.SetCursorPosition(x,y)
let clear () = System.Console.Clear()

/// <summary>Enumeration representing card-suits</summary>
type Suits = Spades | Hearts | Diamonds | Clubs

/// <summary>Card is an object representing af card, with value and suit</summary>
/// <param name="value">Integer representing the card value. 1 is A, 11-13 are
/// picturecards</param>
/// <param name="suit">Suits enumeration representing the suit of the card</param>
type Card(value, suit) =
    member this.value:int = value
    member this.suit:Suits = suit
    member this.toString() =
        let suit =
            match this.suit with
            | Spades -> "spade"
            | Hearts -> "heart"
            | Diamonds -> "diamond"
            | Clubs -> "club"
        let value =
            match this.value with
            | 1 -> "A"
            | 11 -> "J"
            | 12 -> "Q"
            | 13 -> "K"
            | x -> sprintf "%d" x
        sprintf "%s%s" suit value

/// <summary>Hand is an object representing a players hand. A Hand-object can
/// draw (Hand.draw card) or drop (Hand.drop) a card. The hand can be shuffled
/// (Hand.shuffle) and replaced by a new Card Array (Hand.replace cards) </summary>
/// <param name="hand">Card Array that represents the cards on the hand (optional)</param>
type Hand(hand) =
    let mutable c:(Card array) = hand
    member this.cards with get () = c
    member this.drop =
        let lastIndex = (Array.length c)-1
        let card = c.[0]
        c <- c.[1..lastIndex]
        card
    member this.draw (card:Card) = c <- Array.append [| card |] c
    member this.toString() =
        let mutable str = ""
        for i=0 to (Array.length c)-1 do
            if i>0 then str <- str + " "
            str <- str + c.[i].toString()
        str
    member this.shuffle() =
```

```

let len = Array.length c
let testCard = Card(-1,Spades)
let newHand = Array.create len testCard
let test (card:Card) = card.toString()=testCard.toString()
let rnd = System.Random()
for i in 0..(len-1) do
    let mutable j = rnd.Next(0,len)
    while test c.[j] do
        j <- rnd.Next(0,len)
    newHand.[i] <- c.[j]
    c.[j] <- testCard
c <- newHand
member this.replaceWith cards =
    c <- cards
new()=
    Hand([|])

/// <summary>Player is an object representing a Player (AI or human). A Player
/// has a name, index (representing order of game-flow), a hand cards, and a
/// score.
/// The score is updated when called, and are to determine if a player has bust
/// (over 21 points).</summary>
/// <param name="name">String representing the name of the player</param>
/// <param name="index">Integer reprebting the index of the position in
/// Player Array in Game object</param>
/// <param name="AI">Boolean representing whether a player is a NPC
/// (Non-Playable Character) or PC (Playable Character)</param>
type Player(name,index,AI) =
    let h = new Hand()
    member this.name:string = name
    member this.index:int = index
    member this.hand = h
    member this.AI:bool = AI
    member this.score =
        let mutable score = 0
        let mutable es = 0
        for card in this.hand.cards do
            if card.value = 1 then es <- es + 1
            if card.value > 10 then
                score <- score + 10
            else
                score <- score + card.value
        while es>0 && floor(float(21-score)/10.)>=1. do
            score <- score+10
            es <- es-1
        score
    member this.isBusted() = (this.score>21)
    member this.scoreboard() =
        let space = if (this.index+1)%3=0 && this.index <> 0 then " " else " "
        let top = " " + space
        let middle = " " + space
        let empty = " " + space
        let bottom = " " + space
        let x = (String.length top - String.length space)*(this.index%3) + (
            this.index)%3
        let y = (8*(this.index/3)+5)
        System.Console.SetCursorPosition(x,y)
        System.Console.Write top

```

```

System.Console.SetCursorPosition(x,y+1) 111
System.Console.Write empty 112
let xn = (String.length empty)/2 - (String.length this.name)/2 113
System.Console.SetCursorPosition(x+xn,y+1) 114
System.Console.Write this.name 115
System.Console.SetCursorPosition(x,y+2) 116
System.Console.Write middle 117
System.Console.SetCursorPosition(x,y+3) 118
System.Console.Write empty 119
let xc = (String.length empty)/2 - (String.length (h.toString()))/2 120
System.Console.SetCursorPosition(x+xc,y+3) 121
System.Console.Write (h.toString()) 122
System.Console.SetCursorPosition(x,y+4) 123
System.Console.Write empty 124
let score = sprintf "(%d)" this.score 125
let xs = (String.length empty)/2 - (String.length (score))/2 126
System.Console.SetCursorPosition(x+xs,y+4) 127
System.Console.Write score 128
System.Console.SetCursorPosition(x,y+5) 129
System.Console.Write middle 130
System.Console.SetCursorPosition(x,y+6) 131
System.Console.Write empty 132
System.Console.SetCursorPosition(x,y+7) 133
System.Console.Write bottom 134
new(name, index) = 135
    Player(name, index, false) 136
137
/// <summary>Game is an object which is used to contain a collection of data, 138
/// for which is used in-game, like players, a dealer, and a card stack. 139
/// The Game object is responsible for transferring cards from the stack to the 140
/// players.</summary> 141
/// <param name="dealer">A Player object representing a dealer. Player. 142
/// AI must be set to true.</param> 143
/// <param name="players">An Array of Player objects.</param> 144
type Game(dealer, players) = 145
    let s = new Hand() 146
    do 147
        let mutable cards = [|]|:(Card array) 148
        for i=1 to 13 do 149
            cards <- Array.append cards [| Card(i,Hearts); Card(i,Spades); Card(i, 150
                Diamonds); Card(i, Clubs) |]
            s.replaceWith cards 151
            s.shuffle() 152
        member this.dealer:Player = dealer 153
        member this.players:(Player array) = players 154
        member this.numberOfPlayers = Array.length players 155
        member this.stack = s 156
        member this.draw (player:Player) = 157
            if Array.length this.stack.cards > 0 then 158
                player.hand.draw this.stack.drop 159

```

Listing 2: Spillklasser

```

#load "./blackjack.fsx" 1
#load "./headers.fsx" 2
open Blackjack 3
open Headers 4
5
6

```



```

///
///
let validate_name str = String.length str > 0 && String.length str < 25
let validate_yn str = (str = "y" || str = "n")

///
///
///
let printScoreboard (game:Game) =
    clear()
    write mainHeader
    for player in game.players do
        player.scoreboard()
    game.dealer.scoreboard()
    System.Console.WriteLine ""

///
///
///
let selectPlayer (player:Player) =
    let c = (System.Console.CursorLeft, System.Console.CursorTop)
    let fill = "XXXXXXXXXXXXXXXXXXXXX"
    let x = (String.length fill)*(player.index%3) + (player.index)%3
    let y = (8*(player.index/3)+11)
    System.Console.SetCursorPosition(x,y)
    System.Console.Write fill
    System.Console.SetCursorPosition c

///
///
///
let AI (game:Game) (player:Player) =
    let mutable bestValue = 0
    for player in game.players do
        let score = player.score
        if score < 22 && score > bestValue then bestValue <- score
    System.Threading.Thread.Sleep(500)
    let mutable IDare = true
    while IDare do
        let diff = max 0 (21 - player.score)
        let es = Array.filter (fun (x:Card)->x.value=1) game.stack.cards |>
            Array.length
        let p = Array.filter (fun (x:Card)->x.value<=diff) game.stack.cards |>
            Array.length
        let pos x = if x < 0 then -x else x
        if p > 40 || es > 0 && p+10 > 20 || p > 25 && pos (bestValue-player.
            score) < 4 then
            System.Threading.Thread.Sleep((52-p)*60)
            game.draw player
        else
            IDare <- false
    printScoreboard game
    selectPlayer player

///
///
///

```

```

let rec main (game:Game) =
  for player in game.players do
    printScoreboard game
    selectPlayer player
    if player.AI=true then
      AI game player
    else
      let mutable command = ""
      while command <> "stand" && player.score < 21 do
        command <- readln()
        if command = "hit" then
          game.draw player
          printScoreboard game
          selectPlayer player
      AI game game.dealer
      let mutable winners = [||]:(Player array)
      for player in game.players do
        if player.isBusted()=false && player.score > game.dealer.score then
          if (player.score=21 && game.dealer.score=21 && Array.length player.
            hand.cards=2
            && Array.length player.hand.cards = Array.length game.dealer.hand.
            cards)=false then

            winners <- Array.append winners [|player|]
      if Array.length winners = 0 && game.dealer.score <= 21 then
        writeln "Dealer was too good!"
      elif Array.length winners = 0 then
        writeln "No winners!"
      else
        writeln "And the winner(s) is:"
      for winner in winners do
        writeln (sprintf "dot %s (%d)" winner.name winner.score)
      write "New round (y/n)?"
      let mutable input = readln()
      while validate_yn input = false do
        clear()
        write header
        write "New round (y/n)?"
        input <- readln()
      if input = "y" then
        for player in game.players do player.hand.replaceWith [||]
        game.dealer.hand.replaceWith [||]
        main(Game(game.dealer ,game.players))

///
///
///
let setup() =
  clear()
  write header
  let rec nop() =
    clear()
    write header
    write "Number of players (1-5): "
    let c =
      try
        readln() |> int
      with

```

```

    | _ -> 0
    if c < 1 || c > 5 then nop() else int c
let numberOfPlayers = nop()
let mutable players:(Player array) = [| |]
for i=0 to numberOfPlayers-1 do
    let mutable name = ""
    while validate_name name = false do
        clear()
        write header
        write (sprintf "Player %d's name is: " (i+1))
        name <- readln()
        writeln ""
    let mutable input = ""
    while validate_yn input = false do
        clear()
        write header
        write (sprintf "Is player %d a human (y/n): " (i+1))
        input <- readln()
        writeln ""
    let AI = input = "n"
    if AI then name <- name + "(AI)"
    players <- Array.append players [| Player(name,i,AI) |]
clear()
let dealer = Player("Dealer",numberOfPlayers,true)
main(Game(dealer,players))

///
///
///
let rec menu() =
    clear()
    write menuHeader
    let input = System.Console.ReadKey()
    System.Threading.Thread.Sleep(50)
    match input.KeyChar with
    | '1' ->
        setup()
        menu()
    | '2' ->
        clear()
        exit 0
    | _ -> menu()
menu()

```

Listing 3: Spillogikken

Listing 4: Tests