

OS-MINI PROJECT

24-PUZZLE-GAME

CODE:

```
#!/bin/bash
```

```
declare -a path
```

```
tiles=(1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 "-")
```

```
goal=(1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 "-")
```

```
shuffle_tiles()
```

```
{
```

```
    size=${#tiles[@]}
```

```
    for ((i=0; i<size; i++)); do
```

```
        #shuffling using random function
```

```
        j=$(( RANDOM % size ))
```

```
        tmp=${tiles[i]}
```

```
        tiles[i]=${tiles[j]}
```

```
        tiles[j]=$tmp
```

```
    done
```

```
}
```

```
print_grid()
```

```
{
```

```
    for ((i=0; i<25; i++)); do
```

```

#new line every five tiles
if (( i %5 ==0 )); then echo "";
fi

printf "%-3s " "${tiles[i]}"
done
echo ""
}
#checking if it reaches to the goal state or not
goal_State()
{
for ((i=0; i<25; i++)); do
    if [ "${tiles[i]}" != "${goal[i]}" ]; then
        return -1
    fi
done

echo "Congratulations! You've won the game!"
return
}

# Function to find the index of a tile
tile_Index()
{
    local tile=$1

```

```
for ((i=0; i<25; i++)); do
    if [ "${tiles[i]}" == "$tile" ]; then
        echo $i
        return
    fi
done
}
#showing the legal moves
legal_Moves()
{
    empty=${tile_Index "-"}
    if (( empty % 5 != 0 )); then
        echo "Left: ${tiles[empty-1]}"
    fi
    if (( (empty+1) % 5 != 0 )); then
        echo "Right: ${tiles[empty+1]}"
    fi
    if (( empty - 5 >= 0 )); then
        echo "Up: ${tiles[empty-5]}"
    fi
    if (( empty + 5 < 25 )); then
        echo "Down: ${tiles[empty+5]}"
    fi
}
```

```

swap_tiles()
{
    # Get the indices of the chosen tile and the blank tile.
    uTile=$(tile_Index "$1")
    empty=$(tile_Index "-")

    # Check if the chosen tile is adjacent to the blank tile.
    if (( (uTile - 1 == empty || uTile + 1 == empty ||
        uTile - 5 == empty || uTile + 5 == empty) ||
        (uTile == empty - 1 && empty % 5 != 0))); then
        path+=("$uTile") #saving the path
        # Swap the chosen tile with the blank tile
        tmp=${tiles[$uTile]}
        tiles[$uTile]=${tiles[$empty]}
        tiles[$empty]=$tmp
    else
        echo "you should choose only the adjacent numbers to the empty space";
    fi
}

is_solveable()
{
    local inv_count=0
    local size=${#tiles[@]}
    for ((i=0; i<size; i++)); do
        #for blank /empty tile

```

```

if [ "${tiles[i]}" == "-" ]; then continue; fi
for ((j=i+1; j<size; j++)); do

    if [ "${tiles[j]}" != "-" ] && [ "${tiles[i]}" -gt "${tiles[j]}" ]; then
        ((inv_count++))
    fi
done
done

# for size odd
if (( size % 2 != 0 )); then
    if (( inv_count % 2 == 0 )); then
        echo "The puzzle is solvable."
        return
    else
        echo "The puzzle is not solvable."
        return -1
    fi
else
    # for size even
    if (( inv_count % 2 != 0 )); then
        echo "The puzzle is solvable."
        return
    else
        echo "The puzzle is not solvable."

```

```

        return -1
    fi
fi
}

#for printing the moves
print_path()
{
    echo "Path of moves: ${path[@]}"
}

printf "%-20s WELCOME TO THE GAME\nHAVE FUN\n";
shuffle_tiles
while true; do
    is_solveable && break
    shuffle_tiles
done

print_grid
#main loop
while true; do

    goal_State && break
    echo "legal moves are following";
    legal_Moves

```

```
echo "Enter the number of the tile you want to move from legal moves"; echo  
"(press 'q' to quit the game):"; echo "(press p to print path ):";
```

```
read tile
```

```
clear
```

```
if [ "$tile" == "q" ]; then
```

```
    echo "Quitting the game"; echo "BYE BYE LOSER";
```

```
    break
```

```
fi
```

```
if [ "$tile" == "p" ]; then
```

```
    print_path
```

```
    continue
```

```
fi
```

```
if [ "$tile" != "-" ]; then
```

```
    swap_tiles "$tile"
```

```
    goal_State && break
```

```
    print_grid
```

```
else
```

```
    echo "Invalid move. The blank space (-) cannot be moved."
```

```
fi
```

```
done
```

```
print_path
```

```
OUTPUT:
```

```
f219303@f219303-virtual-machine: ~/Documents/24puzzlega...
f219303@f219303-virtual-machine:~/Documents/24puzzlegame$ ./24puzzle.sh
WELCOME TO THE GAME
HAVE FUN
The puzzle is solvable.
11 20 18 13 5
8 23 10 12 15
9 17 6 21 3
22 14 2 4 1
7 19 24 - 16
legal moves are following
Left: 24
Right: 16
Up: 4
Enter the number of the tile you want to move from legal moves
(press 'q' to quit the game):
(press p to print path ):

```

```
f219303@f219303-virtual-machine: ~/Documents/24puzzlega...
Path of moves: 22 21 16 11 6 5 0
legal moves are following
Right: 20
Down: 11
Enter the number of the tile you want to move from legal moves
(press 'q' to quit the game):
(press p to print path ):

```



```
f219303@f219303-virtual-machine: ~/Documents/24puzzlega...
1  11  18  5  15
-  20  13  6  12
9  8   23 10  3
22 2   4  21 16
7  17  14 19 24
legal moves are following
Right: 20
Up: 1
Down: 9
Enter the number of the tile you want to move from legal moves
(press 'q' to quit the game):
(press p to print path ):
```