ECE 175: Computer Programming for Engineering Applications

Final Project: *A Game of UNO*

1 Administrative Details - Read Twice

1.1 Groups

You are to work in groups of **strictly** two students. Team members will be individually questioned on the *entire code*. Team members need to clearly articulate the responsibilities of each member.

1.2 Scheduling Project Demo

You have to appear as a group to demonstrate your code. Sign up your team for the final project demo here on the address below (you need your UA email to access the signup sheet). Slots are available on a first-come-first-serve basis.

https://goo.gl/ry8PBM

Teams or team members that do not demo their code will receive zero credit for the final project.

1.3 Intermediate Code Design Submission

To keep track of your progress, an intermediate code submission is required. The deadline for the intermediate code submission is on **April 18th, 2018 @ 11:00 AM**. Your intermediate submission will be checked on that week's lab. Please submit:

1. A high level design of your code in a PDF. You are free to use any format that makes sense to your team.

2. An initial code implementation, with an UNO deck of cards being implemented as a linked list and a shuffling function that shuffles the deck.

3. A skeleton of the remaining of the code contaiing all the function prototypes and comments on the input/output of the functions and their intent.

1.4 Final Code Submission

The project is due on **April 25th @ 11:00 AM** (starting time of the first lab for that week). Submit your code via D2L – one submission from a group member is sufficient. You may also submit any design documents that will help you explain your code.

Late submission policy: 10% deduction per day.

1.5 Academic Integrity Policy

Each group is expected to submit its own code. You may ask other for advice, and in general discuss the project, but you should WRITE YOUR OWN CODE. If any part of the code submitted by different students is identical, ALL involved parties will receive zero credit on the entire project and one letter reduction in their final grade. This policy will be very aggressively enforced. **ALL submitted code will be checked with a plagiarism detection tool** (e.g., http://theory.stanford.edu/~aiken/moss/).

2 A Game of UNO

You are to develop an interactive game of UNO between two players. The gameplay for UNO is described at https://www.unorules.com/. Your program should operate as follows.

2.1 Setup

1. UNO cards are represented as variables of the following type:

```c
typedef struct card_s {
    char suit[7];
    int value;
    char action[15];
    struct card_s *pt;
} card;
```

You are allowed to add attributes to this definition, but not to remove any. You can represent colors by using card suits. Red: hearts; Yellow: diamonds; Green: clubs; Blue: spades. The action field is used to denote the function of action cards.

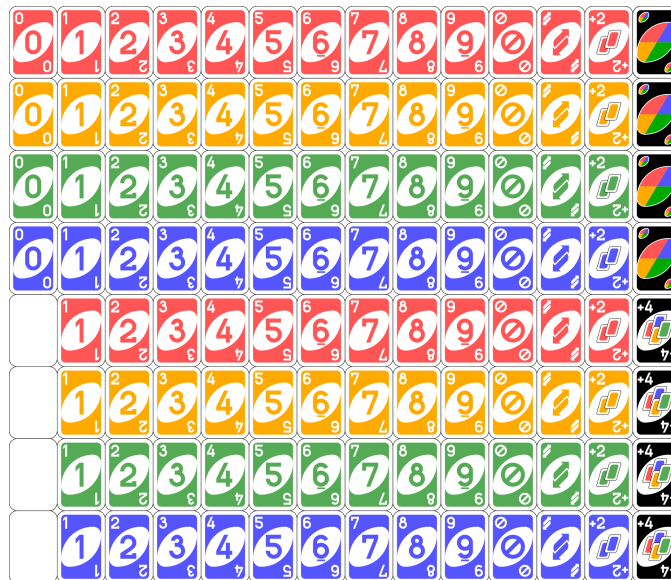2. The game is played using the following deck of cards[1].

Figure 1: The deck of UNO cards.

The following action cards are included:

- **Reverse** – If going clockwise, switch to counterclockwise or vice versa.
- **Skip** – When a player places this card, the next player has to skip their turn. If turned up at the beginning, the first player loses his/her turn.
- **Draw Two** – When a person places this card, the next player will have to pick up two cards and forfeit his/her turn.

---

[1]by Dmitry Fomin https://commons.wikimedia.org/w/index.php?curid=29517498.

- **Wild** – This card represents all four colors, and can be placed on any card. The player has to state which color it will represent for the next player. It can be played regardless of whether another card is available.
- **Wild Draw Four** – This acts just like the wild card except that the next player also has to draw four cards as well as forfeit his/her turn. With this card, you must have no other alternative cards to play that matches the color of the card previously played. If you play this card illegally, you may be challenged by the other player to show your hand to him/her. If guilty, you need to draw 4 cards. If not, the challenger needs to draw 6 cards instead.

3. At the beginning, the user can choose to shuffle the deck or load a predefined sequence of cards from a file (for testing).

4. The deck is implemented by a dynamic list of cards. The cards drawn from the deck are deleted from the list.

5. Each player's hand is implemented by a dynamic list of cards. The list is initially populated with the cards dealt to each player. The card drawn (played) by each player is added to (deleted from) the respective list.

6. The discard pile is implemented by a dynamic list. The discard pile is shuffled if the draw pile is exhausted and the game has not ended. Only the top five cards of the discard pile are shown on screen.

2.2 GamePlay

The gameplay and scoring process are described at https://www.unorules.com/

2.3 Optional Features for Extra Credit

1. **Automate one of the players.** Modify your code to implement one of the players automatically.

2. **Players 2–10.** Allow the game to be played by any number of players from 2–10.

3. **Game Variations.** Implement the following game variations.

   (a) **Progressive Uno.** If a draw card is played, and the following player has the same card, they can play that card and "stack" the penalty, which adds to the current penalty and passes it to the following player.

   (b) **Seven-O.**: When a certain card is played, the player is able to trade hands with another player or with all players. For example, the person who played the 7 card is able to switch all of their cards with another player; the player who played the 0 card is able to make every player exchange all their cards to the next player.

4. **Graphics.** Add graphics to your game. You can print cards using ascii art.

2.4 Sample Execution

Let's Play a Game of UNO

Press 1 to shuffle the UNO deck or 2 to load a deck from a file: 1

The deck is shuffled. Press any key to deal cards

Discard pile: 5♣

Player's one hand: 6♣, 3♣, wild, draw two, 9♥, 2♠, 7♠

Press 1-7 to play any card from your hand, or press zero to draw a card from the deck:5

The 9♥ cannot be placed on top of 5♣

Press 1-7 to play any card from your hand, or press zero to draw a card from the deck:1

Discard pile: 6♣, 5♣

Player's two hand: 3♣, 5♥, 2♦, reverse, 6♥, 2♣, 7♠

...

Player's one hand: 9♥

Player one has UNO

Press 1 to play the card from your hand, or press zero to draw a card from the deck:1

Discard pile: 9♥, 4♥, 6♥, wild, 2♦.

Player 1 wins

Would you like to play again (y/n)? n

Bye bye