

# GAME DESIGN AND ENGINEERING

## FINAL PROJECT GAME REPORT

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### 1. Space :

- Two discrete spaces - The arena (3 x 4) and the queue (1 x 3)

#### The Arena :

- Discrete space
- Dimensions - 3 x 4
- Grid (schell's game spaces)

It is a 3 x 4 grid as the game's attack patterns are defined on a 3 x 3 grid so this allows the fighters to keep some distance in the horizontal direction initially and to dodge .Initially we started with 5 x 5 but this made the game very tedious as it allowed more movement and avoiding attacks ,so we stripped the top row and bottom row,then one column to get the fighters closer.

- Visual space : arena

#### The queue :

- Discrete space
- Dimensions - 1 x 3
- Linear space
- 1 x 3 - heuristically - one movement two light attacks OR two movements one heavy attack was what we had in mind for choosing three and not making it completely luck based if we have more than 4 cards in queue and two was not much different than one ,as we wanted to make it more interesting than just one turn at a time.

## 2.Objects :

- Cards -

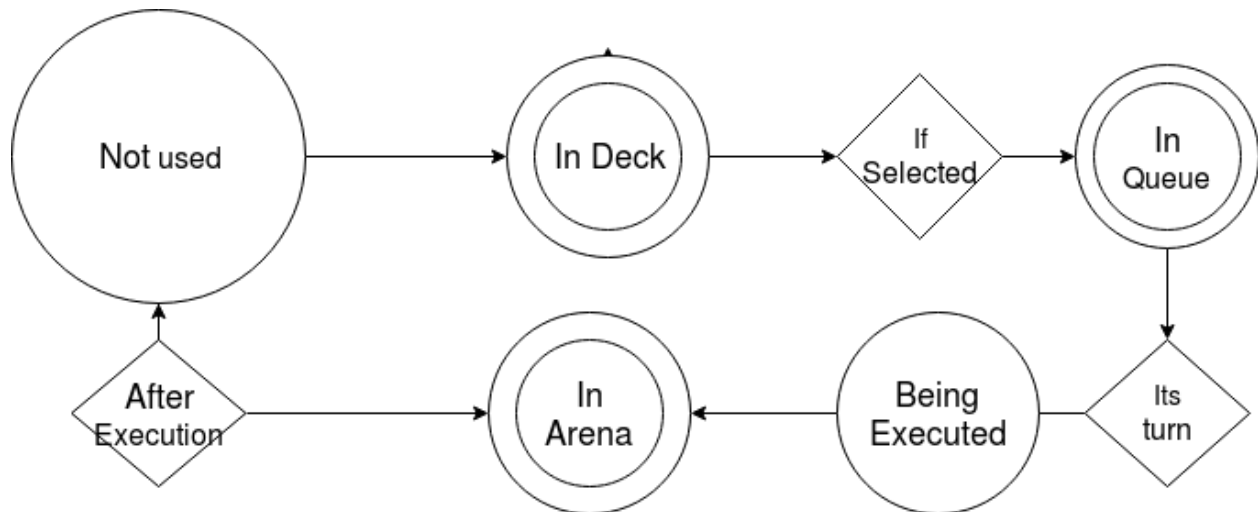
### Attributes :

- Type : Movement /Attack / Energy boost/Guard - static attributes , private attributes initially but since limited number of cards can be memorized and with time become public attributes(known to both players).
- Attack pattern :- for attack cards ,its the locations which if occupied by enemy deal damage(attack range) or in case of movement card ,its the direction of movement and incase to boost /guard card - show the centre location as player location
- Energy : energy requirement to execute that card .
- Damage : damage dealt to opponent if in range of attack
- The attack pattern,energy and damage are static attributes and they are private initially but over time may become public.
- So we make all attributes of cards public.
- Location of the card - dynamic - in deck ,in queue, in arena ,corresponding to the three states -

### States -

- Not used (in deck)
- Queued (in queue)
- Being Executed (in arena)

### State diagram for cards -



- Behaviours -
- When executed cause corresponding damage

- When executed use corresponding energy
- Can be queued if the sum total energy of all queued cards(=3) is less than or equal to available energy.
- All cards have equal execution time - which is the time needed to make changes in energy and damage
- All cards return to deck after execution

- Fighters -

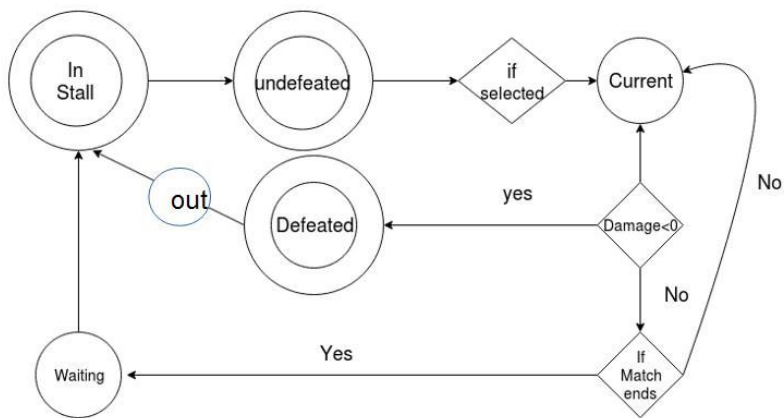
Attributes :-

- Defeat status - defeated/undefeated - dynamic attribute
- Location :In stalls or in arena (corresponding to states - in waiting or current) - dynamic attribute
- Class - static attribute - Universe 6 or Universe 7
- Energy ,Damage
- If in arena - moving ,attacking,guarding,boosting

States -

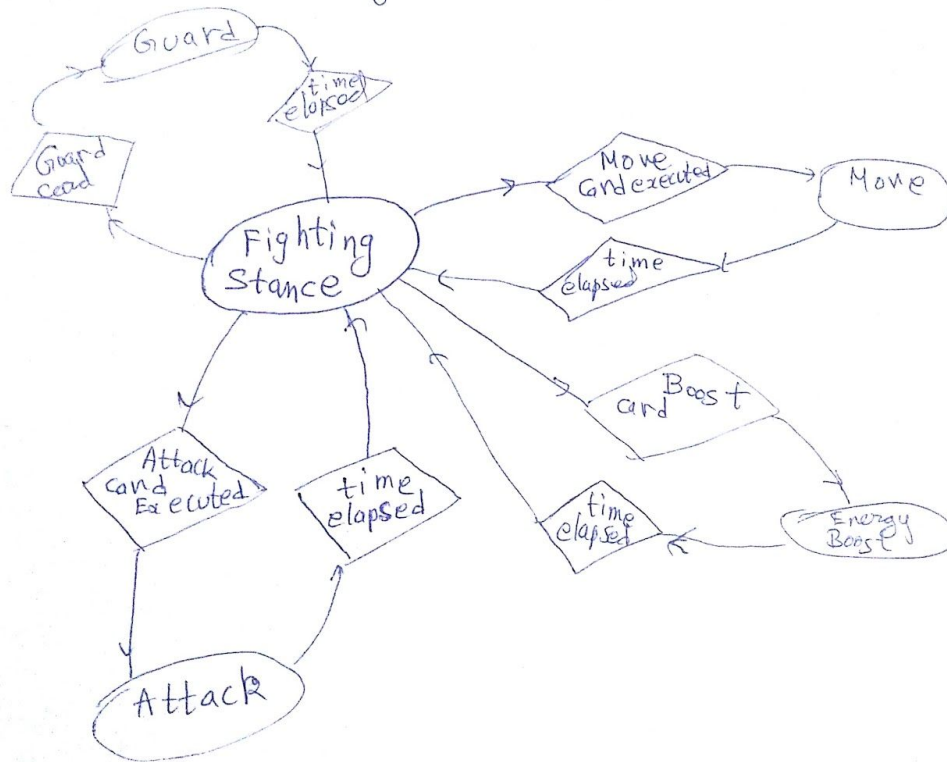
- Waiting
- Current
- Out
- Sub-states of current -
- Moving ,Guarding,Boosting,Attacking

State diagram :-



Sub-states of current state :-

## Sub-state of Current stat :-



### Behaviours -

- In stall ,if undefeated, the fighter waits to be selected for a fight.
- If selected fights,becomes current fighter,fights in arena.
- In arena if damage falls to or below zero becomes undefeated(out state) and is back in stall.
- If match is won is back in stall as undefeated and waiting
- While in arena acts as per the cards executed.

- Energy and Damage Bars -

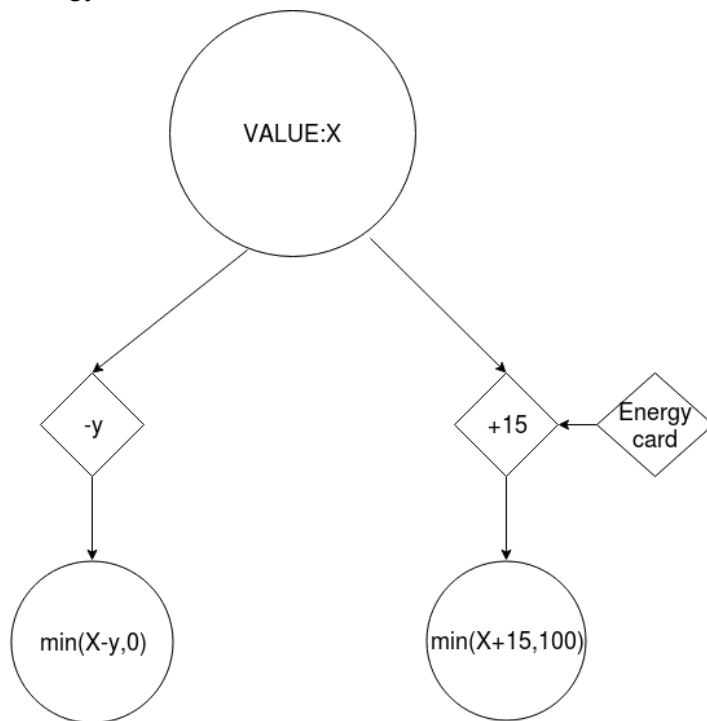
Attributes -

- Class - Universe 6 or Universe 7
- Energy Left in corresponding current fighter (Univ 6 or 7)
- Damage that can be taken still by the current fighter (Univ 6 or 7)

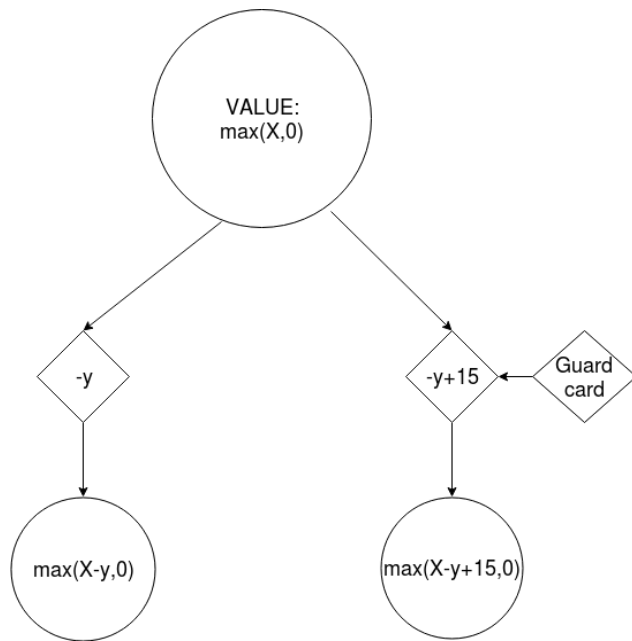
States - multiples of 5 between 0 and 100

State Diagram-

Energy Bar -



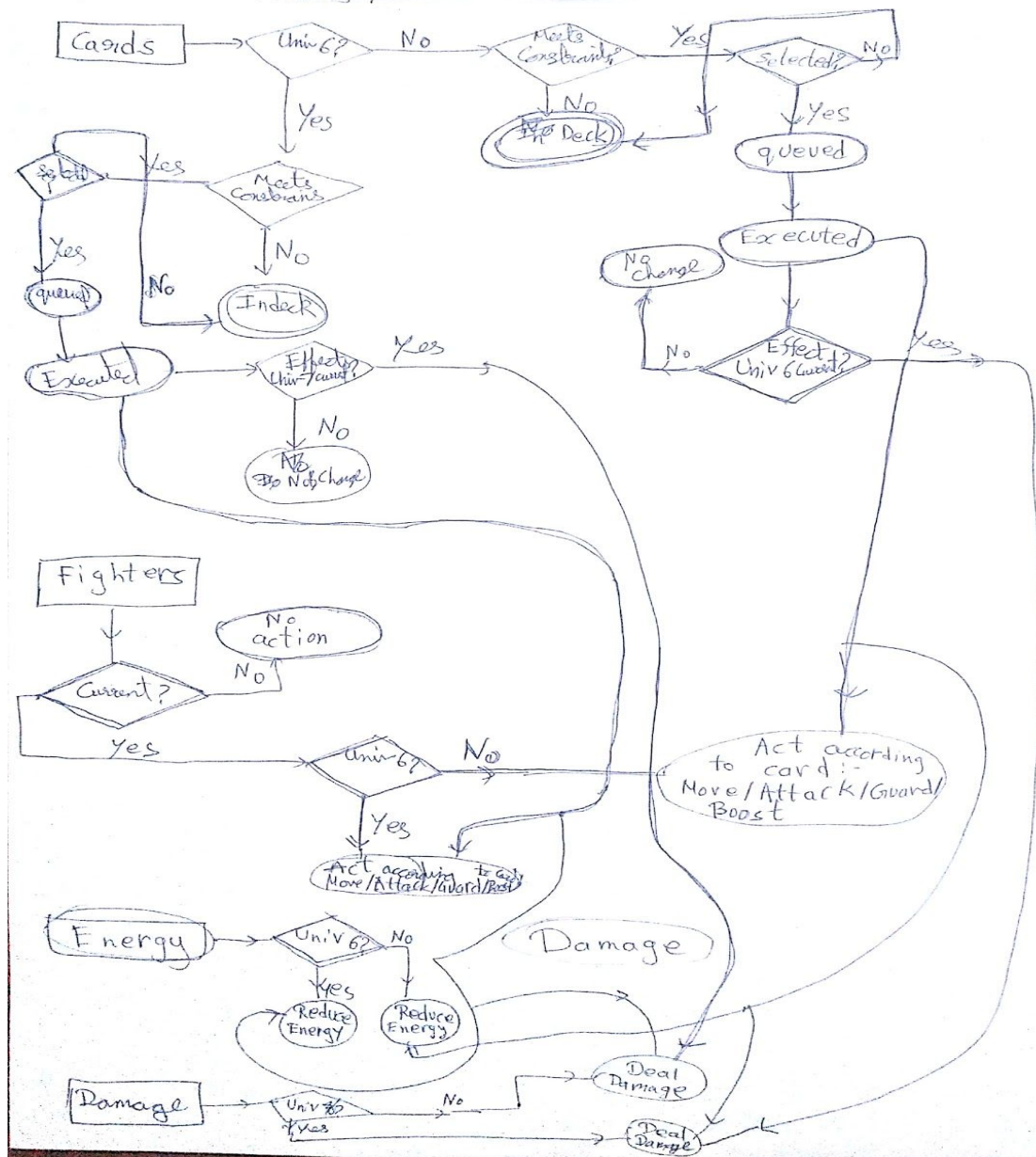
Damage Bar -



#### Behaviours -

- When a card is executed the energy of corresponding class is depleted.
- When a card is executed the corresponding damage capacity is reduced in opponent damage bar.
- At the end of a round if match is to be continued (that is no one won neither damage fell below zero) energy bars of both players are moved 15 units higher.
- At the start of every new match energy and damage of both opponents is kept at 100

#### Object Relations -



- Complexity and Chance -

- The complexity of the game arises due to having to play three moves blindly by only guessing the opponents moves. This gives rise to chance as because unlike chess - when an opponent makes a move which is favourable to the player its a mistake/blunder on his part as all information is available to him. But with this three moves at once thing, it might so happened that a move may advantage/disadvantage the player if opponent chose a move other than what he guesses



- Skill -
  - No particular skills as such but memorization of the opponent's attack pattern is what will allow the player to develop any strategy .
  - Also the player must understand the opponent to figure if he would play attack or movement/dodge next.
- Aesthetics
  - The Theme is dragon ball so the cards feature the respective fighters and common cards feature dragon ball poster.

### 3.Game Rules :

#### Operational Rules -

- The fighter for the current round will be placed on the second row on the square closest to their side.This fighter should be undefeated.
- The deck that can be used for the fighter will consist of its attack cards,bonus cards awarded to their team and one set of movement cards.
- The bars for the damage will be set to 100 for damage and health per fighter.
- Each player chooses three 'legible' cards per session in order to be played.Then in the order the cards of two fighters are compared one by one ,the energy on the card used by a fighter is subtracted from the energy bar of that fighter ,if the opponent's card is effectual then the amount of damage on opponent's card is subtracted from the damage bar of the fighter.
- After every session both players are awarded a +15 to their energy.
- If the damage of any fighter goes to zero,and his opponent's does not he is defeated and cannot re-enter the match.The standing fighter is the winner ,its team will be awarded a point.
- At the end of a round the winner's team ,if any, will choose a bonus card ,the cards will be overturned.

#### Functional Rules -

- Initially anyone can be chosen.
- If both the cards are attack or non-attack they are executed one after the other,if one is attack and other non-attack then the non-attack is executed first.A card is an attack card if the damage it causes is greater than zero otherwise it is non-attack.
- At the beginning of every round undefeated fighters on both sides will be restored to their fullest health and damage irrespective of damage they may have incurred in earlier rounds.
- A set of three cards is legible if their energy requirement added together does not decrease the energy of fighter below zero .

- The movement cards are restricted to 4 -one per direction- therefore at the end of the 3 cards execution the fighter will be within a 3x3 grid with its centre at the position of fighter before execution of first round started i.e., a fighter's x and y coordinate change at max by 1.(+1,-1 or 0).
- Due the discrete values of damage and energy with multiples of 5 ,the damage and energy values at any given time will be some multiple of 5 only.

#### 4.Abstract game :-

Given vector -  $(p1, e1, d1, d2)$  and  $(p2, e2, d2, d1)$  update the vector according to  $fi(p1, p2, e1, d1, d2)$  and  $gi(p1, p2, e2, d2, d1)$   $i = 1$  to  $10/11$  . $[p1, p2$  - positions,  $e1, e2$  - energies,  $d1, d2$  damages of player 1 & 2 respectively ,which one of  $d1$  or  $d2$  reaches 0 first that player loses.

#### 5.Onsite Report :

- The major issue was having to move all the objects - picking three cards,comparing the six cards(3 of each player),shifting energy and damage bars after each card execution manually was tedious ,though we were handling energy and damage bar and players only had to show the cards and move the fighters,though object by themselves were not many in number (3).
- Another issue was the attack patterns we picked - some attack patterns were easily understood by the players and were used efficiently - these were the symmetric larger area ones ,while the ones with lesser area ,and asymmetric ones were not being used much at all .
- Like it was mentioned earlier one needs to know the opponent's attack patterns to be actually devise a strategy. Our idea was to let the first time players just get them from playing but this did not work and the first two games went on for too long due to missing attacks ,players somehow just choosing to keep dodging instead of attacking ,we had to persuade them to get closer and finish.
- From the third game onwards we showed both players their opponents attack cards.This game finally ended sooner .Also in this game the players finally picked up the main catch - there are only four move cards - so a player can only reach a block up,down ,left or right in a turn .So if one uses attack cards with pattern that covers these positions from his position the opponent will definitely be hit.
- Simultaneously if you are in attack range most likely you can also be hit by an enemy's attack - so the situation should be such that one player has low energy so that he can only use low damage cards and the other player much higher energy so this player can use a high damage card - could be the last move.
- So the games took this pattern - first players get closer ,use low energy low damage large attack range cards to deal some damage , then the player who manages to dodge next few similar attacks manages to have higher energy and damage and thus moves in

closer and uses high energy high damage cards ,which is what we had in mind while making the game

- Another issue was the playing 'legit' cards - cards whose energy sum is less than or equal to available ,players often picked cards with greater energy requirement and had to replay the hand which sabotaged opponents strategy as his hand is revealed.
- Finally there was nothing complicated about our game ,our any really great strategy that needed to be developed .So only trying various combinations of attack patterns and fighter combinations would make it any interesting.It was a strange combination of role-playing and card game.

#### 6.Possible Improvements :

- Making the game virtual would improve the interface and user experience.This would also enable to use the game rule engine to see to it that the players pick 'legit' cards only like those in online bridge games do not allow you to fake play a different suit if you have a card of that suit in your hand.
- We could have balanced the attack ranges better.
- The Initial Damage capacity could be reduced - this would give rise to more intense faster game play.
- On similar lines the energy +15 at the end of every turn could be removed so that if a player uses up all his energy he can only use boost ,guard and movement cards so he is open to attack and if his opponent has more energy he will be dealt great damage.

#### 7.Possible Extensions :

- It could be extended to 3 D.
- It could have the tournament take place in levels and include more interesting arenas for say racing matches with few more objects and constraints.

#### 8.Remarks /Feedback :-

Name	Age	Points (10)	Remarks
1) D. Shritiksha Reddy	20	9.5	Innovative Game
2) P. S. S. Saranya	19	10	Interesting
3) Himanshi Maharana	17	<del>10</del> 9	Easy to understand. Game is very long.
4) Abhinav	20	10	Interesting Game
5) P. Sanyu	19	10	Awesome, Interesting
6) Gowar	24	10	Interesting innovative strategy game
7) Mahesh	20	9.5	<del>Idea of using cards</del> Innovative, nice use of cards.
8) Ruchita V	19	10	Awesome, interesting
9) Sanyu Sanyu V	19	9	Good but a bit lengthy interesting.
10) SHREYA	18	10	Nice, fun.
11) Tanvi	17	10	very innovative

## 9. The Cards, Fighters & Design Procedure :

### Attack Cards -

Four per fighter.

### D - damage

If positive it reduces opponent's damage by that amount if opponent is in the range of the attack.

If negative (only guard card) reduces attack intensity by that amount.

E - energy - On attack card reduces the users energy, on other cards increases energy.

And a string of 9 digits

Which represent the positions on a 3x3 matrix row-wise

Ex- 010111010 - this means (1,2) (2,1),(2,2),(2,3) and (3,2) all have 1s and the rest zero

1 - position where attack will have effect

Format - name of attack, D,E,string

Attack cards -

Cabba -

Gallick cannon	50 50 101010000
Impulse slash	15 15 111111111
Sledge hammer	25 15 000111000
Big bang cannon	25 25 010111010

Frost -

Death Cannon	30 25 010010010
Chaos Ball	50 50 000010111
Poison needle	25 25 010111010
Chaos Beam	25 35 101010101

Piccolo -

Special Beam Cannon	40 45 000111000
Hellzone Grenade	25 30 111010111
Light Grenade	15 25 101101101
Masenko	30 15 010010010

Vegeta -

Final flash	35 25 000111000
Final Explosion	50 45 000010111
Gallick gun	25 15 010111000
Big bang attack	20 35 101111101

Goku -

Spirit Bomb	40 50 111010111
Kamehameha	25 25 101010101
Kaio ken	60 50 000010010
Dragon fist	30 20 000111000

Hit -

Cage of time        60 70 000101000  
Phoenix Eye Fist   20 15 000111111  
Dimensional Jump   40 50 010111010  
Time skip            25 20 101010101

Guard - 2 - cards , one per current fighter

Damage = -15  
Energy = 0 (Unaffected)

Boost - 2-cards ,one per current fighter  
Damage 00 (unaffected)  
Energy = +15

Movement Cards -

Move up,Move down,Move left,Move right -

Dm = 00 , En - 00 (Unaffected)

2-cards each ,one per current fighter

Bonus Cards - 4 - bonus cards

1 Hakai (Attack card) - Damage = 25 ,Energy = 15 111111111

2 Special Ability - D,E as listed out    000010000 (Heal/Perfect Guard)  
Heal dm restores energy 60 reduced

Perfect guard Dm - -40 ,energy 25

1 Zeno's wrath :

Damage - XX ,Energy XX        000010000

Thus card can only be used when energy is full.(100)

Unknown damage and unknown energy -

Zeno is the whimsical omni King who may or may not assist the fighter who appeals to him for support

Two dice will be rolled - one to determine energy and one for damage

Energy - 1 00    5 80    4 60    3 40    2 20

6 100

Damage -

1 00 5 80 4 60 3 40 2 20 6 100

5) 3 x 4 board :

Initially started with 5 x 5 board but game tedious so reduced to 3 x 4 s now the enemy is one block closer and fighter can't escape to top or bottom.

Attacks that cover large area have low damage and low energy

Medium area in horizontal or vertical have higher damage and similar energy

Medium area in diagonal have higher damage and higher energy

Less area cards have highest damage and highest energy .

First started with piccolo then frost ,goku ,hit,vegeta ,Cabba

$25 \times 4 = 100$  So we set 4 attacks per fighter .  $100/4 = 25$  and did +10 -10 for varying energy and damage was set about +10/ -10 to energy . The energy keeps increasing so that all the cards can not be used in the same session .The cards with highest damage has less area and if there are more than one high damage cards the higher has very small area 2 or blocks in rare positions.

Lowest energy required was 15 over all cards so a +15 is given at end of every session,if it does not end the round, so the fighter may use atleast one attack card.For the second team of fighters their attacks have rarer positions like diagonal or two bottom rows this was done to make the attacks more like in anime ,accordingly their energy requirements are more as these positions give them some advantage .

Positions :-

Characters and their attacks were arranged in decreasing order of strength - strength is both intensity and area coverage.A characters attacks were then matched with the positions and were allotted damage and energy.

We generate sets of 4 positions ,decide on a character ,and set their energy and damage according to his rank.Since movements allowed are horizontal and vertical only,initially attacks that effect horizontally or vertically only were considered weaker and given lower damage .These patterns are found in weakest player on both sides. As character power started increasing we gave then more asymmetric/uneven positions with greater damage and greater energy requirement . This way even though there is a hierarchy in powers of characters ,if one player chooses a weaker character but the other a stronger ,the weaker player still has a fighting chance as his cards have lower energy he can use more attack cards per turn and symmetri coverage so more chance his attack will take a hit.But he will be affected only if he

stands is fewer positions ,but if the attack takes hit its severe.We found still some characters seemed stronger this was balanced by the special ability bonus card - we gave weaker characters stronger special abilities.One generic attack bonus card with low energy which can be used when player runs out of energy and one card of chance.

First position was 010111010 and was set at 25 25 normal positioning. It was followed by 111111111 ,as it covers more area its damage was reduced to 15 since the damage was very low the energy was also set at 15.Next was 000111000 (derived from 010111010) since its area is smaller its damage is more than its energy - 25,15.Next 101010000 :this was set as highest attack card 50 50 .(Piccolo).

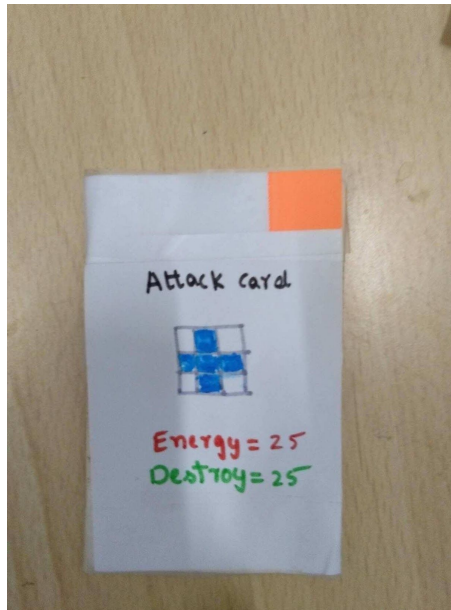
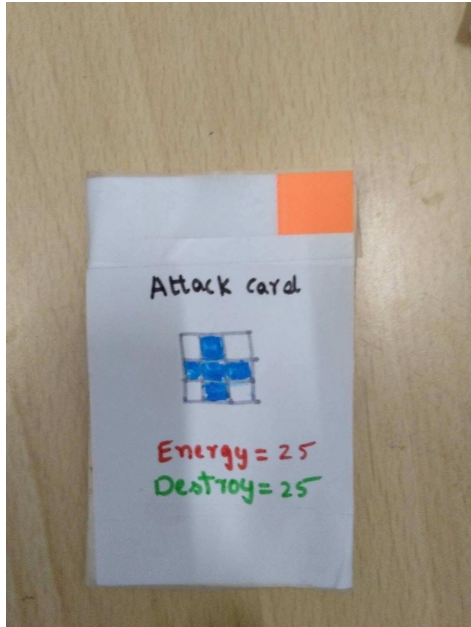
#### 10. Inspiration :-

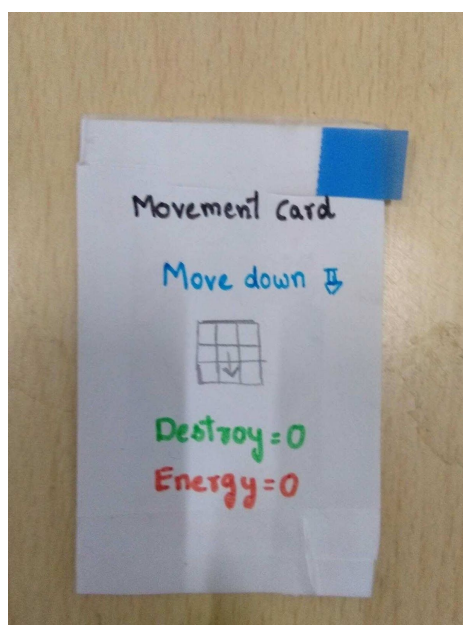
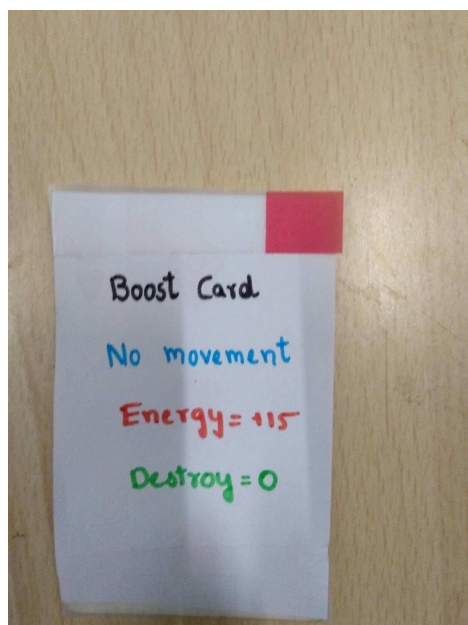
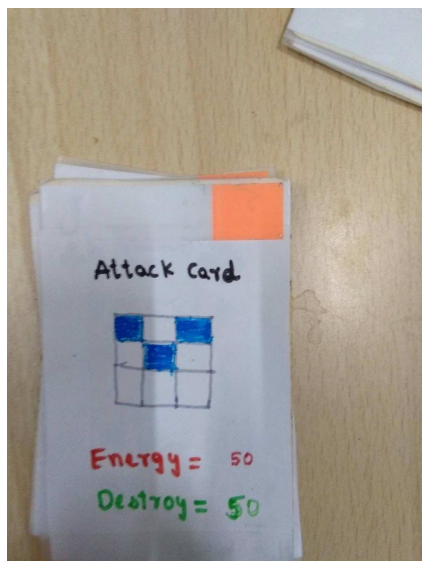
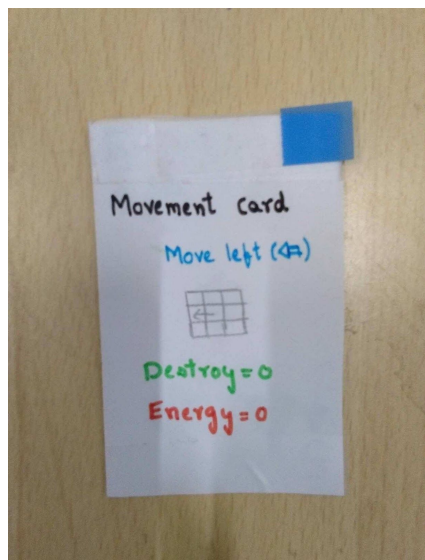
Cardfight Vanguard  
Dragon Ball Super Card game  
Cricket Attack Cards

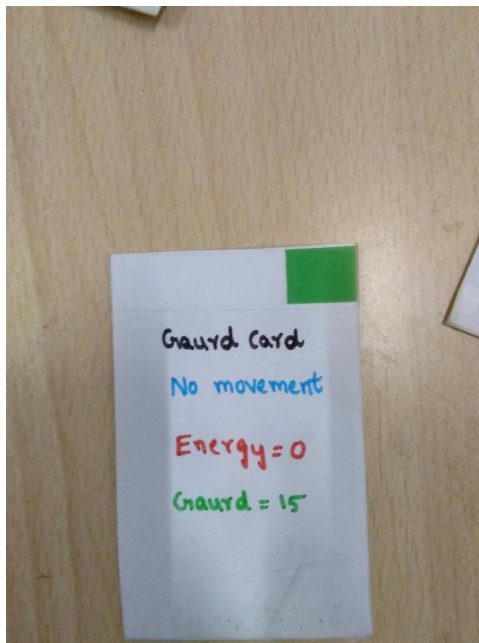
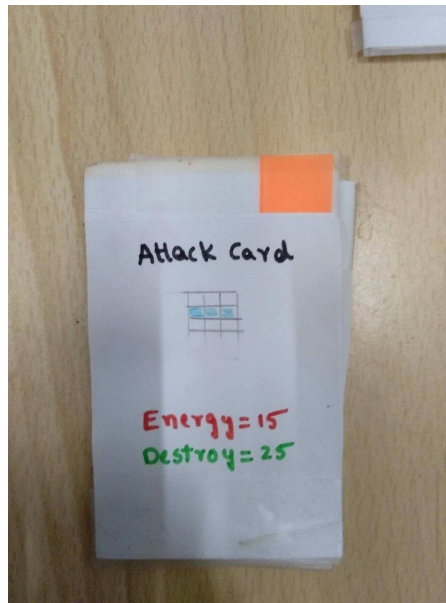
#### 11. Board and Cards :

Cards - attack deck of one fighter :-









The Board :




The Character themes on back of respective attack cards :



.Poster :







