***MathsJam presentation, annual conference 2012 - summarised:***

* David Olive
* Why I'm here
  + Inspiration for 14yos
  + \*Start game on screen\*
  + Here to show software: WebApps - Genius Day
* Qu re card game
  + Top Game
  + Beer and crisps
* Infinite game?
  + What type of infinity?
  + Last year: JGrime + 1s and 0s
  + Beer and crisps
* Now we have the software
  + You can have it too
* Volunteers play game
  + Not programmed - deterministic
  + Large number
* Base 5 representation
* Agency + drama
  + Play more hands manually
  + Auto-play
* Beauty + graphical representation

485 words

MathsJam presentation, annual conference 2012 - full talk, made smaller:

I want to dedicate this talk to David Olive, my uncle, who died just over a week ago and was a very very clever man - he helped to develop string theory at CERN in Geneva in the 80s. I think he might have enjoyed coming to today's event.

One reason I'm here today is that I'm looking for inspirational topics for a maths masterclass for 14-yr-olds, so all suggestions welcome. But the reason I'm here on the stage is that I wanted to show you some software which I wrote on company time with the full support of my employers, Web Applications UK, who are currently recruiting, so I've taken the liberty of bringing along some business cards, as well as free promotional lollipops and pens, yay! So help yourself, and if you're looking for work in software development or web development, either give your CV to me or send it direct to WebApplications and mention my name, because then I get a recruitment bonus. Yay again!

Now, I have a question about a card game called Top Game, which is best played late at night whilst drinking beer and eating crisps.

My question is, is it possible to have an infinite game of Top Game? And if it IS possible, would it represent a recurring pattern, or would it play forever without ever repeating itself? At last year's Mathsjam, I asked James Grime that very question, and he excitedly wrote several strings of 1s and 0s down in... but it was late at night, and I was drinking beer and eating crisps... and I forgot the details.

So, let's play. Two volunteers, please? Names? OK, Jane is player 1 and John is player 2. Jane has started us off with a spud. Fair enough... (play a few rounds and introduce terms along the way. Show the loops, the hands, the record of the starting cards).

The game requires no skill. The cards played are determined entirely by their position in the player's hand, which is decided at the beginning of the game when the cards are dealt. This game is *entirely* deterministic.

BUT this is how many possible games there are: xxx. I struggle to even say this number. I *think* it's something like (...), but it does depend on what definition of billion you're using.

Numerically we could represent an entire game, in terms of every card played in the order they were played, as a giant base 5 number, with 0 for spuds, 1 for Jacks, etc - this hand here would be 0001200... etc. On my to do list is to show that number at the end of a game. Already the software allows you to design games... like this... which helps you to try and design a recurring game (not a trivial task).

The game is most fun if you pretend you are making active choices about what cards to play, and it can be *very* dramatic. (play another couple of hands) Look! John has played an Ace! The idiot! etc. If we speed things up a little... we can see the drama unfold. This game can last an hour or more when played by real people, and there are always tears and laughter along the way. You could be down to your very last card... and yet still you win.

And then there's the beauty and the rhythm. Part of the reason for writing the software was to represent this in some kind of graphical format, and I'm really pleased with the results.

So: it's an interesting question and it's fun to think about. Let me know if you'd like a copy of the software.

967 words

MathsJam presentation, annual conference 2012 - full talk, unedited:

This is all about a game which I and my boyfriend like to call Top Game. It is also known as Beggar My Neighbour, Strip Jack Naked, Beat Your Neighbour Out of Doors and various other names, but we like to call it Top Game because it is, quite simply, top. It's best played late at night whilst drinking beer and eating crisps, and we must have played hundreds of games that way, but for today's purposes you may have to imagine the beer, although possibly not the crisps.

For those of you unitiated in the ways of Top Game, I'll do a quick demo. Two volunteers, please? Names? OK, Jane is player 1 and John is player 2. Jane has started us off with a spud. Fair enough... (play a few rounds and introduce terms along the way. Show the loops, the hands, the record of the starting cards).

Now, you could be forgiven for thinking that I programmed some moves into the computer for demonstration purposes, and in real life the players do indeed choose what cards to play. But no. The players never look at their cards until *after* they have played them. The cards played are determined entirely by their position in the player's hand, which is decided at the beginning of the game when the hands are dealt. This game is *entirely* deterministic. The outcome of the game is already decided as soon as the hands are dealt.

BUT this is how many possible games there are: xxx. I struggle to even say this number. I *think* it's something like (...), but it does depend on what definition of billion you're using.

What I find fascinating about this game is how easily you can convince yourself you have some agency in what's going on, and how very dramatic it can be. (play another couple of hands) Look! John has played a Jack! The idiot! etc. And now let's just click Auto, and the software will play the rest of the game on our behalf, and we can see the drama in speeded-up form. This game could last an hour or more when played by real people, and there would be tears and laughter along the way. You would be convinced you were winning... only to find you weren't. You could be down to your very last card, and that card might be a humble ace (aces are the worst cards of all) and still you win.

But there's more. There's a lot of maths here (tons of trigonometry used to calculate the size, shape and position of all the card segments - show code) but there is one reason in particular that I have brought this game to a room full of maths fanatics. I created this software myself, for two reasons: One is that I have always seen a lot of beauty in the game, and have always wanted some way of representing its ebbs and flows in graphical format. I had this strangely elusive feeling that it could be done, and I could almost see it in my head, but it took me a while to figure out how to turn that into an actual visible thing. Now that I have this graphical format, I can see what's happening to the jacks, I can see clumping in action, and I can get a feel for the beauty and rhythm of the game.

But the other reason was that I wanted to try and answer a couple of specific questions about the game. The first one is, is an infinite game possible? And if it IS possible, would it be a recurring game, with the same pattern repeated forever? Or maybe... could it be like an irrational number represented in decimal form, and never actually repeat itself? Wouldn't that be cool? At last year's Mathsjam, James Grime and I started thinking about how we might represent the pack before it is dealt, as well as the individual hands of cards, as base 5 numbers: 0 represents a spud, 1 represents a Jack, 2 a queen and so on... so this hand here (show hand) would be 0000103... etc... and then you could represent the entire game, in terms of cards played in order, as a giant base 5 number - and you could look at how that number is created. James got excited about how it might link up with a particular bit of number theory he was investigating at the time, and I still have the notebook in which he excitedly wrote a lot of 1s and 0s... but it was late at night, and I was drinking beer and eating crisps... and I forgot the details... and never managed to pursue it. This software, however, was written by me in the intervening period as a way in to considering the problem in more detail, and one of the great things it does is allow you to design games... like this... which helps you to start spotting patterns and understand the complexity of the game. So if anyone wants a copy of the software (it's not big at all), come and see me... and I'll also keep you up to date with bug fixes and extra development. I'm working on an online version, which will allow you to play it over the internet, but it might be a few weeks or months before that's ready. Keep an eye on my Twitter feed: @TheOnlyBAGG (long story).

I want to dedicate this talk to David Olive, my uncle, who was a very very clever man, Fellow of the Royal Society, CBE, helped to develop string theory at CERN in Geneva in the 80s. He died just over a week ago. I think he might have enjoyed coming to an event like this.

Good games:  
1. Lasts a while, some good reversals of fortune:  
P1: AAooooooooooooooooooJJQQKK  
P2: AAooooooooooooooooooJJQQKK  
2. Interesting because one player starts with all jacks and nothing else, but that player loses. Interesting to watch the jacks (= pink) move between the players:  
P1: oooooooooooooooooooQQQQAAA  
P2: oooooooooooooooJJJJooAKKKK  
3. Good reversals of fortune:  
P1: JoQoQKooAoKooooooJooQAoooo  
P2: QooJooooAoJoooAooooKoooooK  
4. Lasts a long time:  
P1: KooQoooooooooooJoooJKoJAoJ   
P2: oooooQoKoQooQKooooAooAooAo

Problems that had to be solved:  
1) How to represent the game graphically in the first place? I had this strangely elusive feeling that it could be done, and that I could almost see it in my head, but it took me a while to turn that into an actual visible thing.  
2) Scaling: Should the size of each loop be exactly proportionate to how many cards are in the hand? Should the central angle represent the correct proportion of 360 degrees? (Show "demo many"). In the end I decided to cap that central angle, which in reality means it only grows proportionally when there is quite a small number of cards in the hand.  
3) Should the calculations take into account the fact that when the central angle changes, the validity of having a third of the cards in each arm and the arc is affected?  
4) How to randomise the pack for effective card shuffling?  
5) In the end I used trigonometry to solve most of the problems involved in building each of the loops and then splitting them up into segments. In terms of technology I used GDI+ via the .NET Graphics class.  
  
  
Cards are represented by little chunks of colour:   
Pale blue = non-face card  
Turquoise = Aces  
Green = Kings  
Dark blue = Queens  
Pink = Jacks

Volunteers: you are player 1, you are player 2

Explain the rules

We're going to play a game. This game is most fun when you hype up the drama to the max, so feel free to pick a player and support them.

[play the game, ham up the drama]

OK, getting boring now... let's speed things up a bit

Still too slow...

You can see the cards if you look up here.

But why on earth would any sensible person care about a card game that involves no skill whatsoever?

Stop it for a minute, have a look at what's happening.

The game is predetermined - the outcome is set as soon as the cards are dealt.

But what's fascinating is that there can be so many reversals of fortune. And some games can last a long time.

Clumping. Graphics. Picking cards / designing games. Infinite games? Numbers of possibilities. What the software can do. All the maths involved. Anyone want to have a go at designing a game?

Things to demonstrate:

The ability to save games via copy/paste

Further notes:

I'm going to carry on developing it, because I want to improve the graphics, and I want it to work for more than two players, and I want an Undo button in manual mode, and I really do want to answer the question of whether an infinite game is possible. I'm taking it to Manchester MathsJam tomorrow night - that's a monthly maths geek event - so I'll hopefully get their combined brain-power involved in answering the question - and I'll keep you all posted. I'd also like to create a website and put the game online, so that other people can tinker with designing games and discovering an infinite game. That would be a great way for me to improve my knowledge of MVC, ASP.NET, Ext JS, too.