CSS 645 - Spatial Agent-based Models of Human-Environment
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Hype in the Video-game Industry:

Analyzing the Effect of Spatial Proximity and Consumer Opinion Dynamics on Game Sales.

Abstract

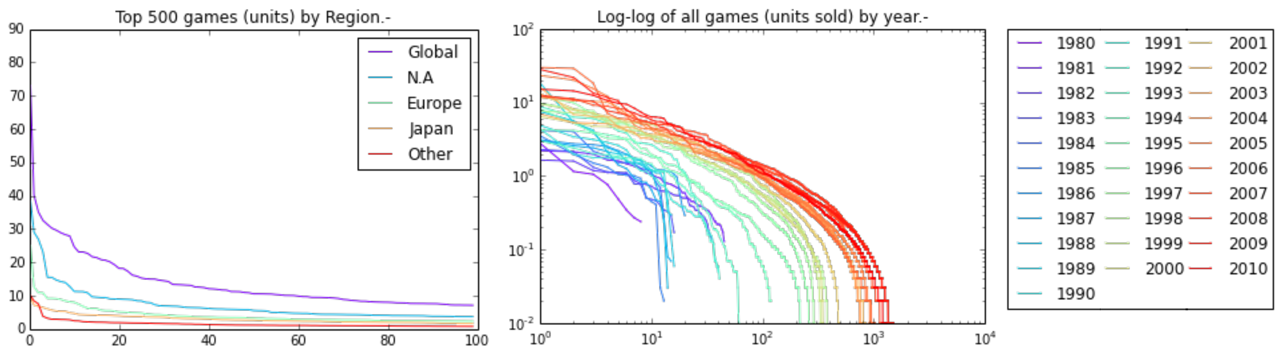
Among the efforts done by marketing practitioners to evaluate and influence consumers preferences the 'mouth to mouth' dynamic is a critical mechanic with a double edge. On one hand this bottom-up process comes free of charge to the supplier, on the other it may turn in an avalanche of negative perception. Today the information transmission flows even faster than before with the use of social media and digital technologies. Understanding the foundations of this social dynamic became an even greater challenge for rapid industries such as the information goods sector. To study the dynamics and the emergence of a massive perception of a new product I implement a simple agent based model of physical and virtual social networks. Using Twitter statuses a description of these dynamics and its geo-reference is presented. Simulation results show how pre-release expectation based information cascades have greater effects in sales than post-release quality based information cascades.

Keywords: *video-game industry, information goods, consumer behavior, spatial agent based model.*

1. Introduction.-

Among the efforts done by marketing practitioners to evaluate and influence consumers preferences the 'mouth to mouth' mechanism has played a critical role. Although it is known to be an effective mechanism once it begins the process also shows to be a double edged sword. On one hand this bottom-up process is cheaper than massive advertisement campaigns or in some cases free of charge to the supplier, on the other hand it may turn out in an avalanche of negative perception (which may be even more expensive to turn around later). Today this kind of consumer communication flows even faster than before with the use of social media and digital technologies. Understanding the foundations of this social dynamic has become an even greater challenge for rapid industries such as the information goods sector. Under the constant release of new products with uncertain quality a challenge rises for both consumers and suppliers. The first one faces the problem to assess the worth or payoff of the new available product with any type of reliable information at hand; which usually is based on experience from other consumers or experts opinions. On the other side, the supplier or promoter needs to assess the market conditions in which this product will be released. Within information goods markets this last challenge has been throughly analyzed in the movie industry showing the high uncertainty and unpredictability faced by producers (De Vany, 2004). Although in De Vany's survey of hollywood economics he exposes how specific problems and barriers have been surpassed by several business strategies, it is also clear that the risk of developing a new feature is still hard or impossible to evaluate effectively. This kind of uncertainty and variability is also present in the video-game industry and though many firms have gained a clear advantage the notion that 'nobody knows anything' still applies. Figure 1 shows how historically (right side) and geographically (left side) the market has shown a long-tailed distribution that resembles a stretched exponential but shows a continuous tendency towards a Pareto distribution. This evidence illustrates the steep gap between a successful or an unsuccessful game.

Figure 1.Regional and yearly (log-log scale)



Although different strategies are already defined in the market to cope with this uncertainty and make a profit they are mainly circumstantial. All of these tactics are based in tacit knowledge and have little or no formal analysis of the underlying processes. The following study attempts to understand and propose a theory of consumer influence dynamics and its repercussion in video game sales. Specifically how game consumers build expectation and communicate their preferences in real life and virtual social networks.

To study the dynamics and the emergence of a massive perception of a new product I implement a simple agent based model of these physical and virtual social networks and the information flows within it. Using Twitter statuses I describe these dynamics, its geo-reference and develop the model. Among other relevant aspects, the simulation results show how information cascades generated by expectation prior to game release have greater effects in sales than post-release information cascades.

1.1. Consumers in the video game industry.-

The evolution of the video game industry has been target of several changes that have changed not only the way games are played but when, where and who plays them. In the last thirty years it has developed into different parallel sectors that also have influenced the supply side having changes in distribution, development tools, etc. Trying to define the typical consumer in such a rampaging market has been a challenge ever since. Although one of the first breakthrough games such as 'Pong' were developed intentionally for drunk people at bars (Cohen, 1984) the common knowledge in society has converged into the belief that video games are for children and teenagers. Additionally, even with the fact that video game development has not thrived too much outside children and teenager themes it is commonly known in the industry that *gamers* are far from being underaged individuals. The average consumer is 35 years old and only 26% of the consumers are under 18 years old (E.S.A., 2015). The Entertainment Software Association has also revealed that even with a relatively uniform distribution of genre (44% female, 56% male) we still have the misconception of a male-driven demand. It is even more surprising that female players are significantly older with an average age of 43.

With very diverse consumers the question of segmentation and who is who in the video game industry has put its scope in other aspects such as game genres, content or hardware (which have also been a challenge considering that people doesn't exclusively related to just one of them). Though trying to understand properties of consumers has been an enormous challenge there is a general characteristic that plays a key role: herd behavior. Shelfs and digital stores may be filled by games that eventually will be bought by some, but in any given time the trends keep showing that no more than 15 games are the most adopted choice. This selections narrows even more during critical release dates or christmas, when we may see that 3 to 5 games are the full center of attention of the market. Under the hypothesis of the author this kind of herd behavior is what shapes the long-tailed distribution of game sales, and so, analyzing how this behavior emerges is critical to understand this and other industries of similar traits.

1.2. Information cascades and network externalities in information goods.-

A theoretical and simple way to address the problem of public information and its dynamics is proposed by (Bikhchandani, Hirshleifer and Welch, 1992). The key mechanism proposed to understand several socio-economic and cultural processes is based in information cascades. These cascades are basically a sequentially adopted trend that under certain thresholds become a default option for all decision makers. Their general model (Bikhchandani, Hirshleifer and Welch, 1992. 1998) consists in homogenous individuals facing uncertain payoff in their decisions. The individuals proceed to make decisions and reveal their action in one scenario or their action and declared payoff in the other. All information gathered by individuals (being actions or signals) is added to the public information pool. The model is not only simple but also establishes a high probability of triggering cascades, thus negative and positive cascades appear almost all the time. Although they define negative and positive as the adoption of the worst and better payoff respectively, in this paper both terms will be used regarding the value of preference or perception. Thus, when we talk about a negative or positive cascade we are referring to avoiding or preferring certain product. The most critical limitation of this simple model is the idea of sequential decisions and communication. To surpass this challenge attempts have been made to study the same information cascades under networks and partial public information access (Easley and Kleinberg, 2010). In an attempt to address the issue in information goods markets of high complexity and complicated understanding of segments and typical consumers a theoretical approach is appropriate.

1.3. Understanding demand and consumer behavior in the digital era: From bad to worse.-

As already mentioned the video-game industry has evolved swiftly and now with the digital platforms and communications shares a common situation within a general social and cultural habit. Governing the 'hype' between game consumers has been an effort of controlling local and national advertisement, stores placement, printed and visual media among others. Today the efforts have endured and molded into the digital landscape with more capabilities to target their audiences. Once again understanding the audiences appears to be critical but the fact that this new era provides the ability to have a global village of consumers makes it even more complex. The herd behavior seems to be more prone to occur within a highly connected network and the 'mouth to mouth' mechanism evolved from local clusters to a wide and interconnected small world. The steeper snowy hills of this small world put advertisement and inter-consumer influences as the critical aspects to make the big snow ball roll.

1.4. A proposal to understand consumer herd behavior and information goods.-

The following work build upon a proposal to study herd behavior in information goods markets and a first approach to the problem of influence between heterogenous consumers using agent-based models. This particular methodology is proposed to test several hypothesis and theories of consumer behavior. Agent-based modeling is particularly adequate for this as it allows to test theoretical derived assumptions within a framework of several empirical discoveries. As one of the particular aspects considered in this study are real life connections and groups proximity the spatial element plays a central role in the diffusion of consumer preferences. Once again, the agent-based model methodology serves a second purpose allowing to build a model with explicit spatial representation of the consumers.

As already mentioned through the following pages I present an spatial agent-based model of consumer influence dynamics in virtual and physical relationships (Section 2). After a description of the process of collecting data and tools I present a more detailed theoretical and empirical analysis of the modeled agents with some verification and validation aspects (Section 2.2 and 2.3). In the third section I show some results concerning consumer influence dynamics, effects in sales and relevant discoveries regarding spatial proximity. Sections 4 and 5 refer to discussion and conclusion respectively.

2. *Methodology.-*

For the purpose of hype construction and consumer communication in video-game products an empirical approach was done using Twitter data. Between the dates of November 8th in 2014 and March 9th in 2015 twitter mentions of key video games were gathered daily. The specific sample considered english language tweets that mentioned one of the predefined 'highly advertised' (also known as triple A) game. The specific game names used for the search were: *Alien Isolation, Bayonetta 2, Grand Theft Auto V, Hearthstone, Fifa 15, Call of Duty: Advanced Warfare, Dragon Age: Inquisition, Titanfall* and *Dying Light.* Although not all these games released within the period of data extraction they all reflect particular characteristics of the so called 'AAA' games. This specific sample was intentionally addressed to understand a broad type of consumer, game style and its dynamic in the market. The purpose of collecting these tweets was to build a proxy for hype and consumer preference. Once the texts with game mentions were processed using a sentiment analysis algorithm another analysis was done to address the properties of the Twitter social network. From user data the respective structure and activity of the selected sample was defined. These parameters were the reference to calibrate the agent-based model for consumer communication and influence.

2.1. *Summary of tools, language, analysis and purposes.-*

Several tools were used to extract, analyze data, and build the model. Twitter data was extracted using the company's API with status search for the already mentioned games. The analysis of the tweet texts was done using a sentiment analysis algorithm. All data analysis including the description of user network, retweeting graphs and user activity probability distribution were all done using Python 2.7 in a Unix environment. The same language was used for the agent based model development and simulations.

2.2. Agent based model Overview, Design and Details.-

To understand the virtual and spatial influences in consumer herd behavior and game sales the present agent-based model was developed based on network interactions. As mentioned before one of the key aspects of real social systems of herd behavior is its network structure. With the purpose of understanding this type of behavior the model considers two types of networks: real life relationships and virtual relationships. To accomplish this agents move in a spatially explicit level and in a virtual one. The model is built upon three main agents: a) the consumers, b) the game stores and c) the market. The market agent is set as the environment for product releases, virtual and spatial interaction. The model simulates a period of three months with a temporal scale of 8 hours. Only one game is considered to be released by one store franchises with the release date fixed to the end of the first month of simulated time. All consumer agents are informed of the game's development and the release date, they also have complete access to the game once it's released.

The following overview describes the mentioned agents (which parameters and initial conditions are depicted in Table 1) and their behaviors, the overall dynamics of the model and certain specific details to facilitate comprehension and replication if intended. The simulation code is available by request to the author.

2.2.1. Agents.-

Market agent.-

The market agent sets the environment for the other agents. The market agent accounts for all public information, sales and spatial distribution. The market is composed by consumers and stores. This agent keeps track of interactions and determines the release of the game, which is immediately available to all stores for supply and all consumers for demand. As mentioned the market generates a single game per run in the 30th simulated day with a random quality distributed uniformly. This one dimension quality variable is evaluated by those consumers that decide to acquire the product. The resultant evaluation is the difference between game quality and current game preference, thus high expectations require better quality for a good evaluation. After any consumer evaluates the market game his game preference is updated by the evaluation difference.

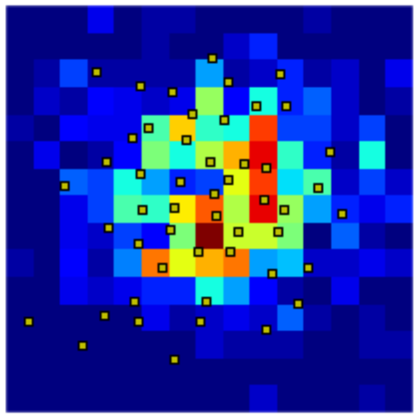
Table 1. Agent properties.-

Agent	Properties	Initial value
Market	Consumer population	1000
	Store population	50
	Game Quality	Uniform
	Game sales	0
	'Twitter' activity	0
	Consumer Network	-
Stores	Client network	Nearest consumers
Consumers	Preference	Gaussian (m=0,sd=0.1)
	Physical Connections	Nearest store clients
	Number of Virtual Connections	Paretian (alpha=1.8)
	Spatial Position	Preferential attachment
	Opinion	Gaussian (m=0,sd=0.1)
	Game consumption	FALSE

Store agents.-

The stores agents represent different franchises from one retail company (e.g. GameStop, Walmart). These agents look for clusters in the agents spatial distribution and position themselves to cover major consumer zones. This position also circumscribes the limits of agents physical networks, making the stores the center of 'real life' social interaction among agents. Figure 2 shows the position of stores through the land covered by agents; the cell grid indicates the population density. Once stores detect their particular positions consumers proceed to look for stores using simple euclidian distance. When all consumer agents have found the closest store then they are able to build their local social network. Once store agents have their client network they take a passive role.

Figure 2. Spatial density and store clustering.-

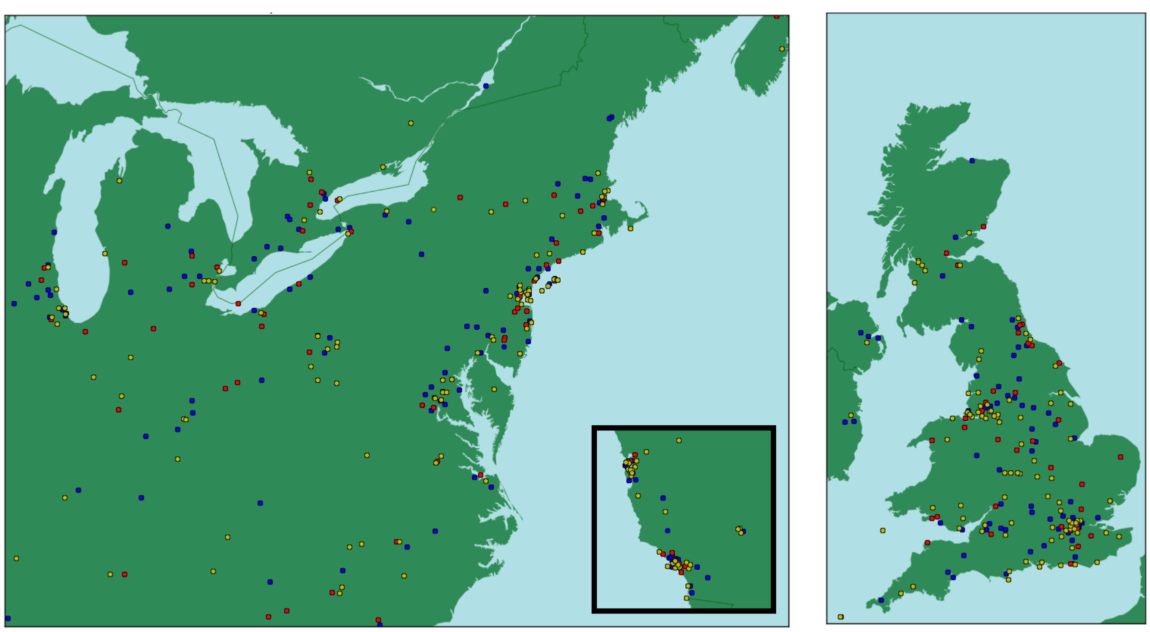


Consumer agents.-

These agents are the central part of the model. They are connected by two social networks; one based in store clusters (real life relationships) and another in a random Paretian distribution (social media). The specific amount of real friends depends on a uniform random sample from the store cluster and the number of virtual connections depends in a random sample of the Paretian distribution with an alpha value of 1.8 (specific distribution calibrated to the twitter data analysis). Consumers have preferences and transmit them (depending on their activity level; also calibrated to empirical analysis results) through their networks. Every interaction they perceive influences them in a different degree: 1.5% for heavily connected agents (such as celebrities), 3% for regular virtual connections and 30% for real life connections. This percentage is taken from the influencers opinion, being positive or negative.

The relevance of geographical locations of consumer agents goes beyond the formation of real life relationships and clearly beyond the scope of this model. It is known that geographical regions delimit not only countries but cultural and sub-cultural aspects. The video game industry has not been a stranger to this fact knowing that the successful release of certain games and hardware depends heavily on regional matters. Although the critical limits of this region clearly lie between country wide and household wide ranges. The interesting question is how to detect the size and formation of these geographically related sub-cultural trends. In this particular model the purpose is to address real relationships and have a preliminary survey into this geographical and cultural self-reference phenomena. From the twitter data it is possible to detect geographical position of the potential consumers and some of the geographical clusters seem to have a correlation by polarity (Figure 3).

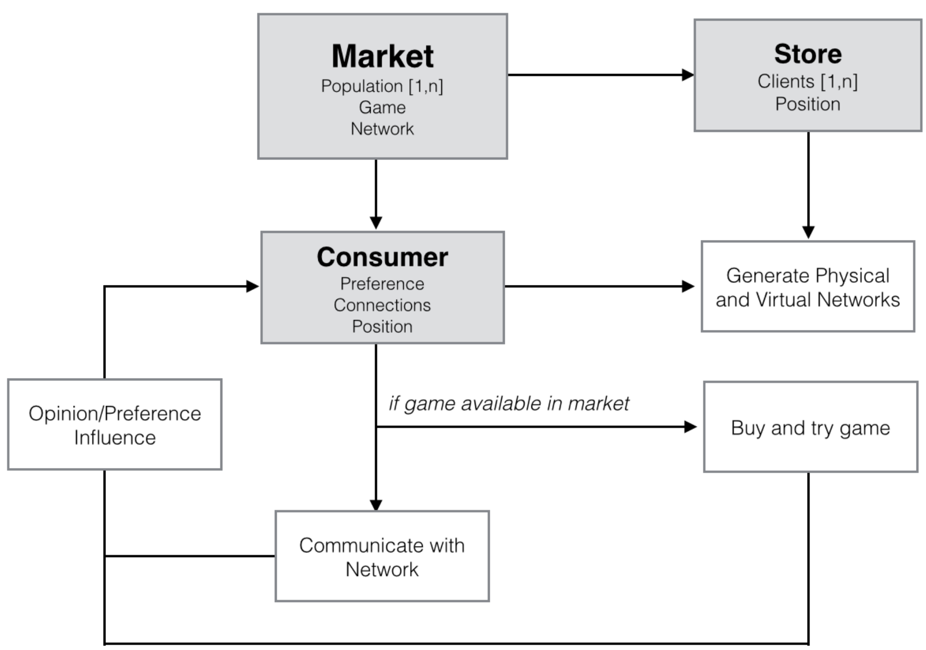
Figure 3. Geo-referenced tweets in United States and United Kingdom.-



2.2.2. Dynamics.-

As already mentioned the model dynamics are mainly based in multi-level social networks. The simulation begins with the market agent populating the landscape with consumers and stores. Once they have generated the respective networks then the simulation runs for 120 days composed by 3 periods of 8 hours each. Agent activation is mainly based in the activity threshold of consumers that is calibrated to a Pareto distribution. Each period consumers that are activated either buy the game or communicate through their networks. When they communicate their connections are influenced if they perceive it. If the consumer buys and tries the game he influences himself regarding his own expectations and the game quality.

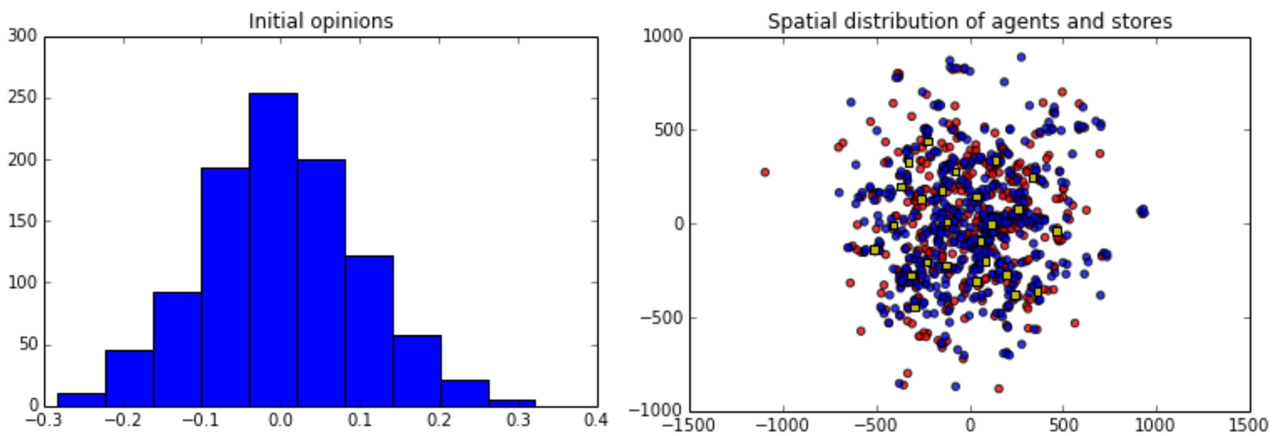
Figure 4. Simulation agents and procedures.-



2.2.3. Initialization conditions and tests.-

The simulation considers 1000 consumer agents with 50 stores. Coefficients for random sample attributes are all referred in Table 1 with other parameters of the initial conditions. Is important to mention that the initial distribution for consumer preferences is based in a Gaussian distribution with mean 0 and standard deviation of 1. Spatial distribution initialization is based in a preferential attachment algorithm with an error based also in a Gaussian distribution. Figure 5 depicts the initial opinion distribution (left) and spatial locations of consumers and stores (right).

Figure 5. Initial conditions for preference and location.-



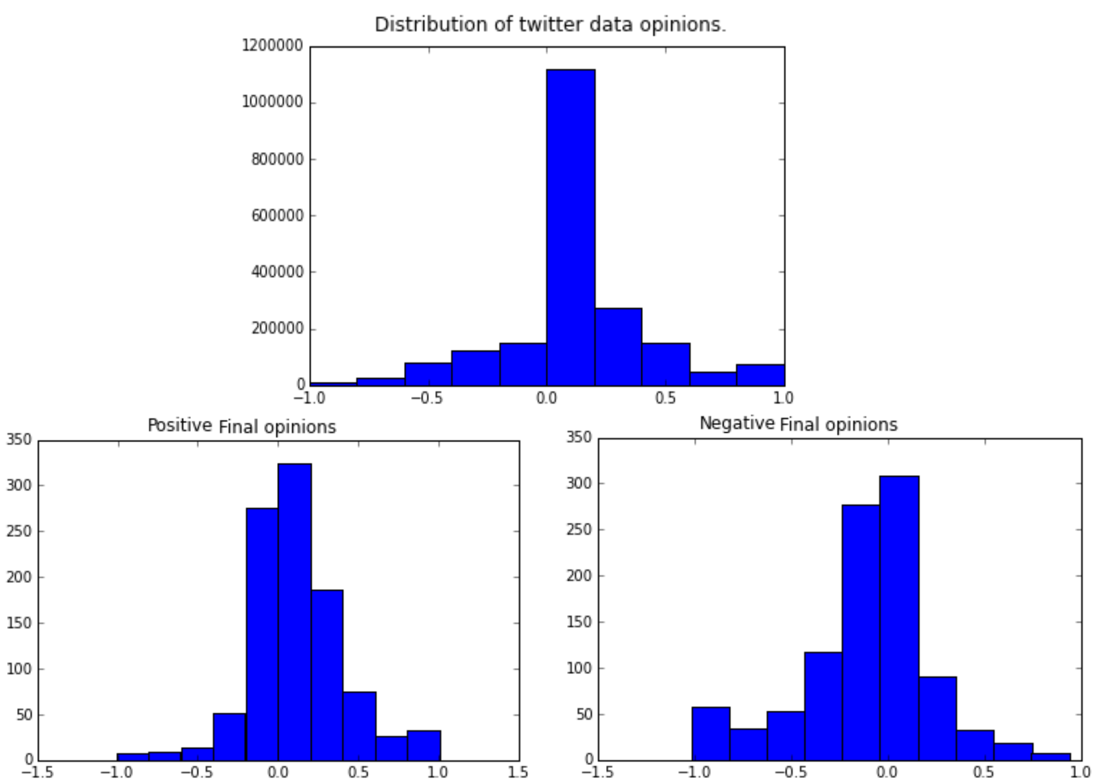
The information provided in the results section corresponds to the output of 100 runs with the mentioned parameters settings. To assess the relevance of spatial proximity two sets of 50 runs were executed with and without local networks. The only parameter that was changed in these simulations was the access to store clients network. During verification processes several unique runs were executed revealing critical aspects of the model.

2.2.4. Verification and Validation.-

Although it is difficult to point the result of the verification process without direct inspection of the code here I present some of the procedures involved in this process. First of all the use of selective data outputs (e.g. printing variables throughout the procedures) to clarify all processes was used. Modular and incremental development of functions and object methods were the standard procedure to develop the model. Extreme values (not necessarily related to parameters or system's variable) were used to test the outcome of functions and the total simulation.

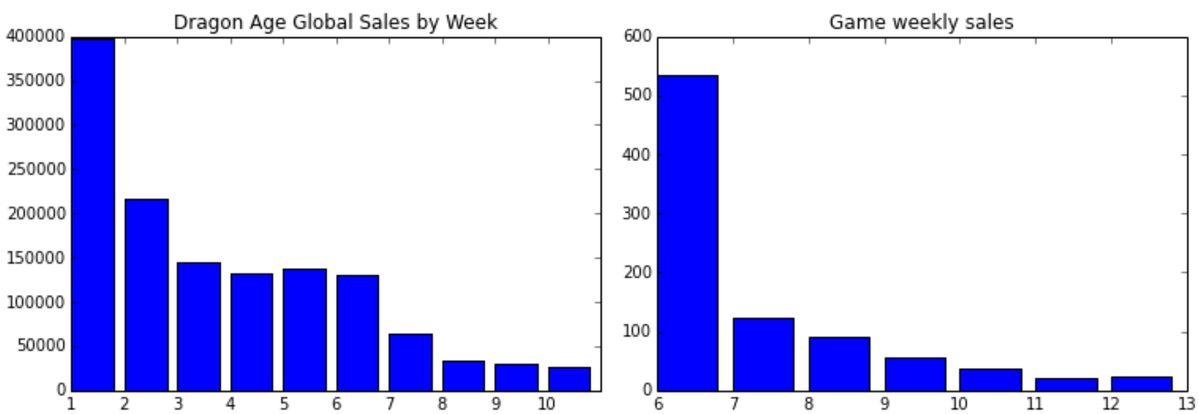
Regarding validation the model incurs in two levels of validation. From the twitter data is possible to frame some validation measures in the micro-level and macro-level. Regarding the micro-behavior of the model certain parameters were calibrated to twitter user data. Most of these variables are given in a Pareto distribution with the alphas mentioned before.

Figure 6. Comparison between twitter data and simulation output.-



On the other hand, given the availability of macro-patterns it is also possible to address the validation of the simulation output. Figure 6 shows the empirical distribution of total final opinions over the three months of extraction. In the same figure, below the empirical distribution we may see the results of one positive and negative information cascade respectively. Although not always we have information cascades in the model, the real data shows a qualitative correspondence with the simulated cases of positive information cascade. Another parameter that has qualitative validation with real data is game sales. Simulation outputs show the same skewed distribution with a strong opening week and posterior small sale weeks. This pattern occurs even when the simulation has heavy positive information cascades. In the case of real life data we see that even the most successful games also present this pattern. Figure 7 presents a comparison between 'Dragon Age: Inquisition' sales (one of the year's best seller) and the output of a positive cascade simulation run (the positive case was selected to compare qualitative similar conditions).

Figure 7. Comparison between real sales data and simulation output.-



Aside from this empirical based validation we also have the presence of structural validation of the more formal and theoretical elements of the model. Throughout the incremental development and verification it was possible to assess that the expected linear and non-connected influence of consumers responds to the theoretical model proposed by Bikhchandani and his coauthors (Bikhchandani, Hirshleifer and Welch, 1992). This behavior persists and is possible to be seen in the connected and heterogenous implementation as well.

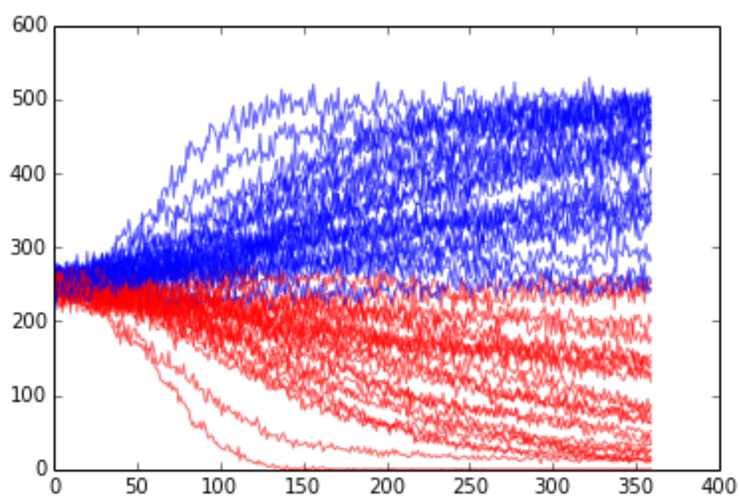
3. Results.-

The simulation results show a variate of interesting scenarios. The first results showed here describe the 'typical' scenarios with some particular discoveries that correlate qualitatively with the target system. After these scenarios a more detailed analysis of the probability and likeliness of such scenarios is presented. From this analysis is possible to show results regarding the influence of information cascades in sales and the respective impact that provides spatial proximity in this particular model. A final remark indicates the relevance of spatial influence and how the simulation presents opinion segregation.

3.1. Typical scenarios.-

The simulation results show a variate of interesting scenarios. The first results showed describe the 'typical' outputs of the simulation such as positive and negative cascades. As shown in Figure 8 the range of consumer agent preferences varies widely among simulation runs. From a random normal initial preference that provides a similar amount of negative and positive adopters the simulation grows toward one or another. Most of the runs have some level of information cascade through the network.

Figure 8. Information cascade variability.-



Positive and Negative Cascades.-

As it is a central part of the model most simulation runs show some degree of information cascades throughout the social network. The continuous and linear growth of either positive or negative preference indicates that one of these aspects is filling through the network. An important difference between these cascades is the moment where it triggers. It is important to make a distinction between pre-release and post-release information cascades given that the game is released after the first month and that it may influence the consumers opinion through its quality. Although it may be difficult to assess if a mild cascade was enforced by the game quality it is possible to distinguish between cascades that clearly triggered before the game's release and those that break the preference equilibria via the new game's quality.

Quality influenced cascades versus pre-release information cascades.-

Those cascades that begin after the game is released are clearly influenced by the game's quality. Although it has a low probability of affecting the behavior the quality of the new product acts as a control check for cascades that don't assess the product worth adequately. On the other hand this also means that pre-release cascades have an underwhelming effect in posterior consumer choices even if the final product presents a general higher quality. The probability of having a quality influenced cascade is 11% for local networks simulations and 24% for those without local influence.

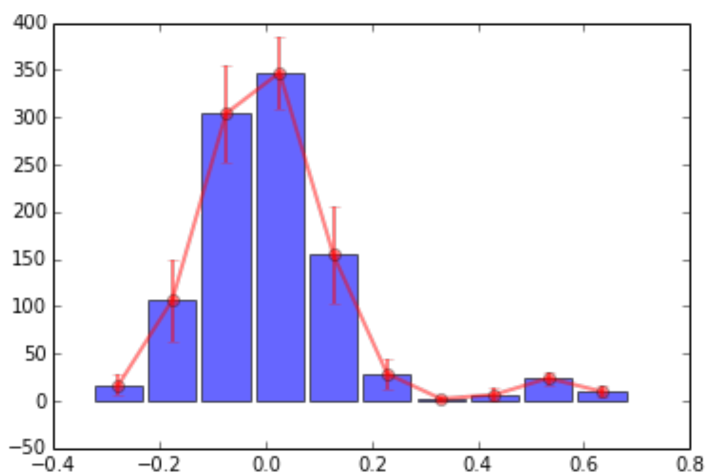
3.2. Opinion range analysis.-

It is possible to see that the simulation results show a wide range of behaviors regarding the preferences and the underlying network cascades. Following the particular scenarios analyzed in the preceding section we now survey the distribution of final preferences in two different cases: a) active local relationships, b) no local relationships.

a) Simulations with local network relationships:

The results for opinion distribution with local networks show a general elevation in kurtosis of the initial Gaussian distribution. The total opinions seem to incline towards a neutral attitude. As it is appears in Figure 9 we may see the final average opinion distribution with its respective standard deviation (in red). On the right tail of this normal distribution a relatively stable (small standard deviation compared with other parts of the distribution) amount of positive opinions remains. The presence of a stable portion of consumers that have this level of positive attitude could be caused by those agents that inevitably like the game (e.g. consumers with very low standards that still buy the game). Still, the presence of such a low variability throughs new questions considering that even the 'low standard' consumer group should reveal more variations within different simulations.

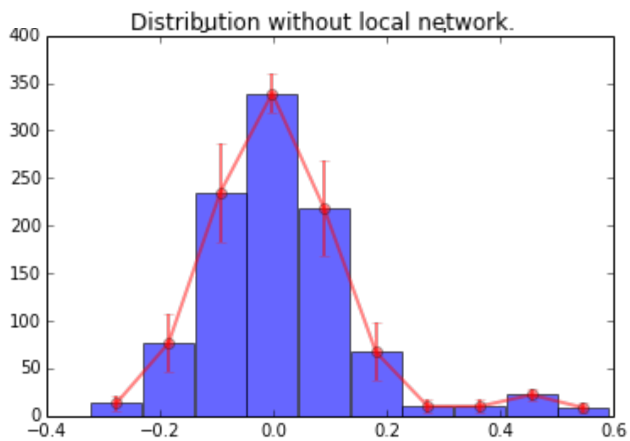
Figure 9. Average distribution of opinion with local networks.-



b) Simulations without local network relationships:

The outputs from the non-local network scenario is similar to the simulations with local network connections. Figure 10 shows a more evenly distributed Gaussian with smaller variation. This indicates that although with a slight difference the local network relationships setting enforces a more skewed distribution. On the other hand, a non-local network setting provides a more wide variation and thus polarization of opinions. Differences seem to small and not statistically significant, it is possible that simulations with bigger populations and more experiment runs could reveal the significance of these differences. Independent from this distribution differences it is evident that the non-local network case also shares the stable 'positive attitude group'.

Figure 10. **Average distribution of opinion without local networks.-**



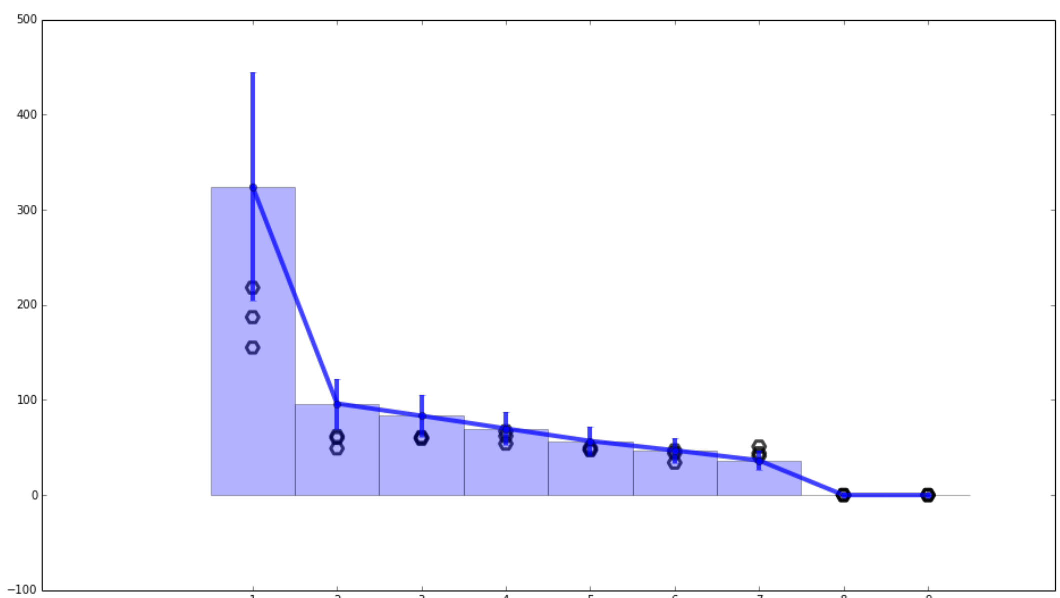
3.3. The effect of hype in sales.-

We've already seen that network cascades may trigger before or after the game's release, a further analysis of average game sales reveals that this cascades significantly affect the profitability of a particular product. Following the preceding structure the results are shown for scenarios with local and virtual network and those without local networks. For each scenario average game sales are presented for either positive and negative cascade outputs.

a) Simulations with local network relationships:

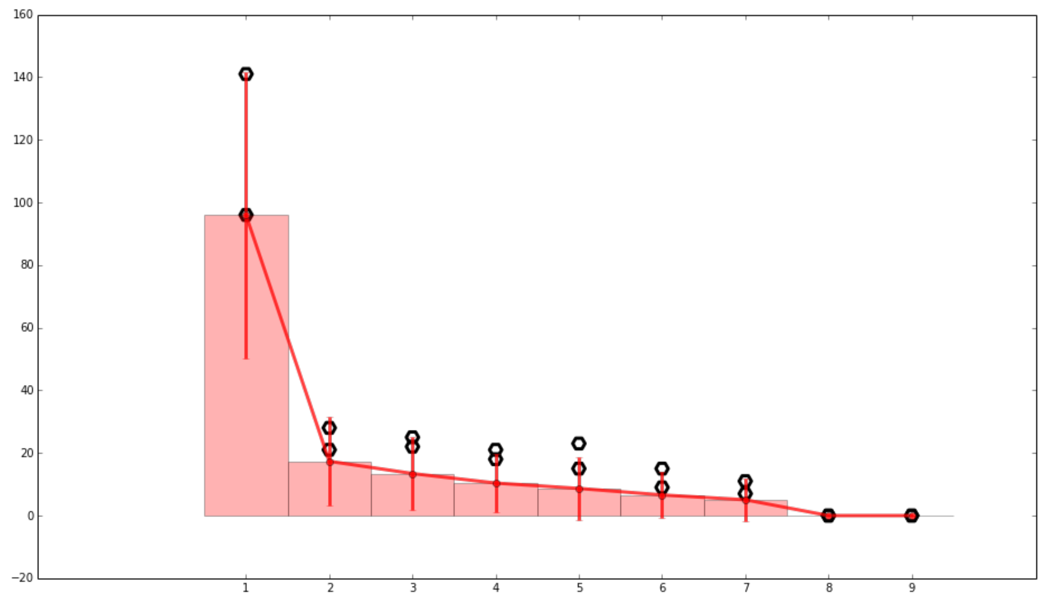
One of the most relevant results from the experiments is the effect of cascades in the product's sales records. In the case of positive cascades with local networks the experiments reflect that network cascades originated before the game release have higher impact in sales than post-release cascades. In Figure 11 the bars reflect average weekly sales with error bars indicating the standard deviation. In the same figure, black hexagons point total sales from simulation runs where the positive network cascade was generated after the game's release. Results put in evidence that having a good game (even capable of generating a positive cascades) is better than having a bad quality game; the worst good game generated a total sale of nearly 400 units and the best bad game gathered around 260 units. The interesting results appear when sales are compared with pre-release and post-release cascades. Good games that generate positive cascades earn less than one standard deviation from the average pre-release cascade game, in other words a good game has a significant disadvantage compared to hyped games. Thus, producers would always prefer to have their game in a positive cascade than investing in a production with high standards of quality.

Figure 11. Average weekly sales distribution under positive cascades.-



Although games that trigger a positive cascade show a clear disadvantage against pre-release positive cascades, they also seem to have a more robust sales behavior. While the average sales decreases continuously the ‘good game’ sales present a stable sale ratio with smaller decrease rates. These sustained sales even present a higher output on week 7.

Figure 12. Average weekly sales distribution under negative cascades.-



As expected, negative cascades show the opposite behavior. Bad games that trigger negative cascades aren’t as powerful as prior negative information cascades. The effect of a negative hype (pre-release cascade) is smaller revenues.

b) Simulations without local network relationships:

Differences between local and non-local network scenarios do not differ too much in the effect of hype. The same patterns apply being a positive pre-release cascade always preferable and a negative one always the worst case scenario. The main difference between simulations with real life networks and without them is the amount of games that trigger a cascade once they are released. Figures 13 and 14 show these games in black hexagons for the respective categories.

Figure 13. Average weekly sales distribution under positive cascades.-

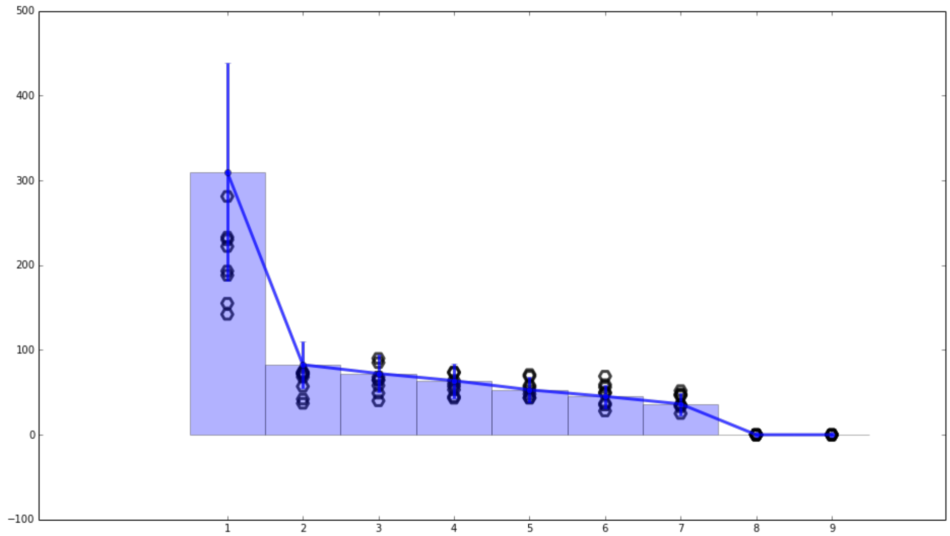
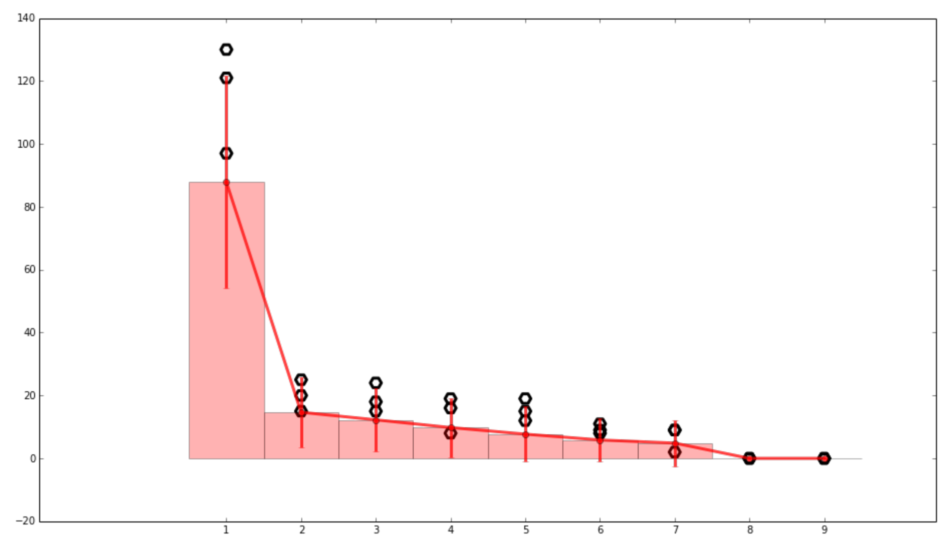


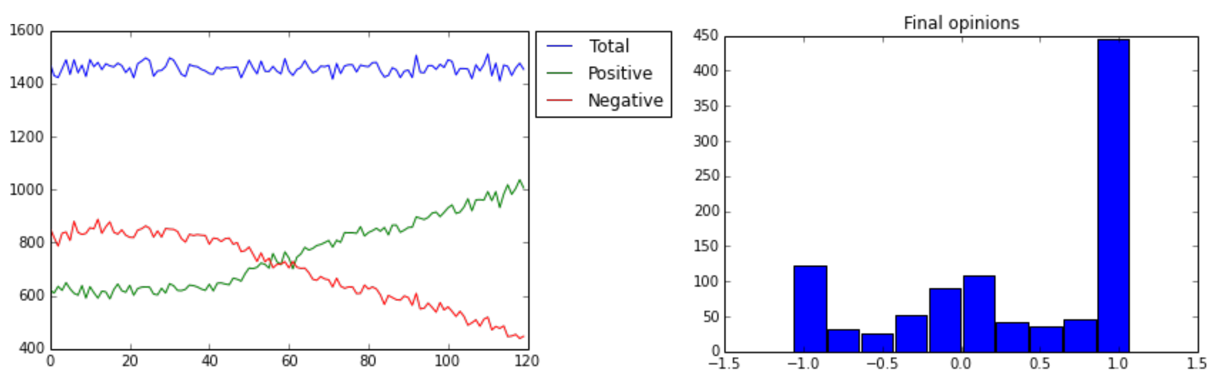
Figure 14. Average weekly sales distribution under negative cascades.-



3.4. Spatial influence and opinion segregation.-

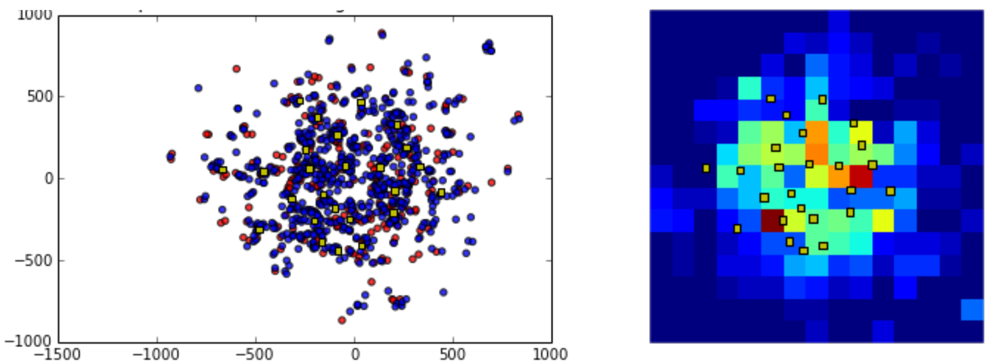
A unique property seen in simulations with local networks is the capability of the whole system to change an information cascade direction (Figure 15). In this particular output the result is most likely given because of a high quality game, nevertheless this behavior does not appear when the network is only based in the virtual connections. In the same figure the distribution of the same simulation final opinions shows that there are three clusters of preference; a vast portion with a complete positive attitude towards the game, a second group that seems to be rather indifferent and the last one that has complete negative attitude.

Figure 15. An example of cascade reversal an opinion polarization.-



In a more in-depth analysis of the spatial effects and repercussions we may see that in this particular kind of scenario (although not necessarily with a cascade reversal) the consumer agents have polarized opinions that appear to be based on local clusters. As the spatial distribution is generated by a random preferential attachment not all simulations have the same location particularities. The output from Figure 15 is generated through the spatial positioning of agents in two major clusters. The density matrix presented in Figure 16 indicates how two cells (shown in red) have a significantly higher density. Although the opinion segregation may have been generated by this two big hubs we may see in the same figure that they share a positive attitude (depicted in blue) and thus the extreme negative opinions come from small groups in the the clusters' border.

Figure 16. Spatial segregation of opinion and population density.-



As there are limited stores and a wide range of these smaller and spatially auto-correlated groups is possible to make the hypothesis that these clusters are not emerging from local influence only but a particular combination of local and virtual network influences. This results seem even more interesting given that in some experiments outputs of simulation without local networks there is also spatial segregation with polarized opinion.

4. Discussion.-

Some of the early results in the attempt to model herd behavior have shown that a simple approach is good enough to clarify and replicate the general aspects of the real system. It also gives an *in silico* indicator of the relevance of information cascades based either on expectations (pre-release) or experience (post-release). Results show what seems to be already a tacit knowledge for advertisers and marketing practitioners, it is always better to have consumers 'hyped' before the actual game release. It is possible to say that this is commonly known by suppliers as they invest heavily on advertisement and on the fact that even for the most successful games the distribution of sales is always skewed towards the first week. Both facts indicate that the industry is highly driven by pre-release cascades, as it is possible to also see in the simulation outputs. Though this may be a common conception within the industry the results also show that the relevance of pre-release preference is even more relevant than the game's quality. A bad game sales better if it didn't trigger a pre-release negative cascade, but a good game by itself won't sale better than another good one that launches in a pre-release positive cascade. Given the vast amount of advertisement and marketing campaigns in the market it is possible to assess that industry actors have already incorporated this knowledge. Although advertisement is seen as critical aspect of any product at sale, the specific campaigns for 'AAA' videogames are so massive that attempts to position themselves in mainstream media. Further work should include specific experiments to assess the impact of game quality in the respective scenarios.

5. Conclusion.-

As already mentioned this paper shows a preliminary work in the analysis of consumer behavior regarding information cascades and empirical analysis of herd behavior. Early results already indicate that spatial proximity affects the dynamics of the community final preferences and the products sales as they show a higher probability of post-release cascades. Overall simulation results put to evidence that a simple approach to herd behavior may grow into patterns that are qualitatively similar to the real system behavior. Results concerning hype and sales suggest that a strong investment in triggering pre-release positive cascade, knowledge that seems to be already present in the industry. A final inquiry into spatial segregation of opinions show that consumers location is not irrelevant in the development of herd behavior. Furthermore, results indicate that even with a simple predefined local network the segregation of opinions is not based purely on the effects of that local small world. Further works should further develop the validation and construction of real life relationships networks as well as more detailed and vast geo-referenced twitter data. With this improvements and specific locations of mass retailers it would be possible to micro-validate the spatial distribution of the agents in the model. On the other hand, a disaggregated sales data could make even more specific the spatial analysis having consumption data from particular locations and the opinion activity around it. Within the short term, one of the main objectives would be to address this issue using available data from North America and the United Kingdom. A comparison between this two regions (although in a significantly aggregated level) could lead to initial comparative understandings of the interconnected effects of consumer influence and spatial proximity on game sales. This could allow us to determine with more detail the effect of pre-release hype versus post-release information cascades.

6. *References.-*

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