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THE UTILITY OF A PANIC MODEL ON SIMULATING CROWD DISASTERS

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ABSTRACT

Panic is a commonly used concept for explaining the result of a crowd disaster, but still without a well-accepted definition. Here a weak definition, disorganization due to fear, is used to define the individual panic, an early form of mass panic. By choosing a different definition, panic is found everywhere in major crowd disasters, and plays a vital role in leading to a tragic result. Six elements are used to explain the occurrence of mass panic, which is a catalyst for a crowd disaster. A panic growth model is proposed to explain the process leading to mass panic. Campus stampedes in China, 48 in total, shown the role of panic on initiating a crowd disaster. The concept of panic will facilitate the crowd managers to understand the nature of a crowd disaster and identify clues of disasters in any crowd scenario. This model combined with exiting panic algorithm, can facilitate the numerical simulation of a crowd disaster.

INTRODUCTION

More than thirty years ago, Sime's famous paper (Sime, 1980) have clarified some myths about panic and illuminated the life safety design regarding human behavior under emergency. However, the debate on panic never dies down. The newspaper continues to use panic attracting eyeballs, and some field officers still uses panic for better explaining the result of a crowd-related disaster, while academic researchers deny its existence. Current evacuation models reviewed by Kuligowski (2008) adopt normal evacuation dynamics, unable to simulate those behaviors under emergency. There is a need to define critical behavior, so a crowd disaster can be simulated along with normal behavior. Panic level is a good index for predicting this critical turning point.

As the Chinese military author, Sun Tsu, said, order and disorder are a matter of organization (Chertkoff et al., 1999), crowd managers are also searching eagerly for an index to characterize the organization in a crowd, so they can take preventive measures against a potential disaster. A measure of disorganization is a useful concept in crowd simulation, while panic can be tailored to serve this role.

Here the concept of panic will be rechecked, and a new definition is proposed in order to bridge the gap between academia and general audience. Using panic level for an index of disorganization, we can gauge the potential of a disaster in a crowd. Even panic is rare and un-predictive, the pattern of panic growth can still provide the proactive clues to a disaster. So the concept of panic has some utility on crowd management.

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A NEW LOOK AT DEFINITIONS

Panic is a volatile concept without a widely-accepted definition. Rogsch et al. (2008) have compiled 16 definitions from various sources plus their own definition. Some of them are listed in Appendix. Most definitions are stressing the emotional features in panic, while there are some researchers checking the disorder (physical) side of panic. Unfortunately, most of them stress the psychological part of panic, and put rationality as a criterion to find panic behavior. As Smelser (1998) pointed out, rationality in social science is a relative concept. So it is extremely difficult to use rationality in identifying panic in a disaster. An extreme evacuation behavior can still be rational to its patrons (instead of irrational judged by an observer), so panic is nowhere to find. Some researchers tried to define panic as a concept similar to or parallel to stampede or crush. They also could not find panic, except the well-defined stampede or crush (Rogsch et al., 2008). In fact, there is not a single disaster well-accepted as panic-related in the fire research community. So panic is always labeled as a myth (Keating, 1982) and confirmed by various researchers (Drury, 2006, Rogsch et al. 2008). This view has paved the way for simulating crowd movements, but is insufficient to simulate a crowd disaster.

In this work, panic is a measure of disorganization, so we can record the volatile crowd behavior by estimating the panic level. Panic is also a growing concept, which has two levels or stages, individual panic and mass panic. The individual panic is

disorganization due to fear, while mass panic is disorderly flight leading to a disastrous result in a crowd. Both stress the outlook of panic, without troubling to find out the psychological state of the affected patrons. This type of definition (on mass panic) is close to the classical definition of Smelser's "a collective flight based on a hysterical belief" (1963) and the collective retreat from group goals into a state of extreme 'privatization' of Park et al. (1921). Mintz (1951) states it as groups of people frequently behave in a way which leads to disastrous consequences not desired or anticipated by the members of the group. Here the result is stressed for the purpose of easy diagnosis. Any crowd disaster (usually with more than one death) has some kind of panic (disorganization) involved. It is not panic causing the disaster, but the panic-stricken patrons could not make the right decisions under emergency, leading to a disastrous result in an indirect way. Panic is something not measurable but inferable. Most frontline emergency responder inferred the panic from the result retrospectively, not observing any panic from the scene (Sime, 1980).

Here panic is a concept similar to the entropy in thermodynamics. Usually, we cannot measure fire entropy directly, but infer it from the measurement of temperature, flow and others. Similarly, we cannot measure panic directly, but infer its level from other measurable quantities, such as the level of internal crushing forces, how many shoes off their position, how many people died from the fault of others, etc. Even if the concept of panic cannot be quantified, we still can use this concept to explain the process of a disaster, enriching our understanding on emergency management.

Though panic is not directly measurable, efforts are taken to diagnose the progress of a panic, such as Helbing et al. (2007), where image processing technique is resorted to find the clues of panic. Other potential parameters of panic diagnosis include the pressure to the wall, the crowd density through weight measurement, or the noise level in the crowd. A good diagnosis will promote the quick attention from the administrative. As we will see in the panic growth model, the prompt response will reduce the scale of a crowd disaster to a minimum. This is the utility and the purpose of such a panic model for crowd management.

A PANIC GROWTH MODEL

The systematic study on panic behavior has lasted more than 100 years. Modern researchers (for example, Chertkoff, et al. 1999) always cite Gustave Le Bon as the first researcher on studying the collective behavior of crowds. Le Bon tried to explain the French revolutionary activities from the "psychological crowd" perspective, ascribe the degrading of crowd characteristics into an inferior form. Since the members in a crowd have an unconscious (or inferior) social identity, the crowd behaves like an animal herd (Le Bon, 1895). This simplified the nature of a crowd-related disaster. Other psychologists try to explain the occurrence of panic under flight instinct (McDougall, cited in Chertkoff et al. 1999), or people as a source of danger (LaPierre, 1938). The most famous panic theory is proposed by Smelser (1963) who mainly focused on financial panic. His value-added theory is a general theory for collective action and includes six factors. In order for the panic to appear, each factor is necessary, but not sufficient. The six factors are, in sequence: (1) structural conduciveness; (2) structural strain; (3) growth and spread of a generalized hysterical belief; (4) precipitating factor; (5) mobilization of participants for action; and (6) absence of operation of social control. However, this model is too general and need more adjustment for the crowd safety. This work tries to tailor his model into various escaping scenarios, and specifically designed for crowd management purpose.

Following Smelser (1963), six elements are identified for the panic growth model as shown in figure 1. The first three factors are enough to start the individual panic, while another three factors are necessary for mass panic to occur. Smelser (1963) used the "valued-added theory" from economics to stress the dynamic process with an assumption that certain conditions are needed for the development of a social movement. Here the dynamic feature of his theory is strengthened, while two additional factors (the enforcing event and the time factor) are used to stress the specific stimuli for mass panic.

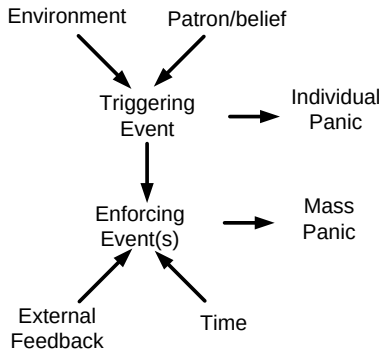


Figure 1. Six elements in a panic growth model

Note that the panic level is developed in two steps. In the first step, only individual panic was developed and the patrons will seldom admit that they were experiencing panic. Only when the following event(s) are enforcing the previous event, and the social control

is missing, the anxiety level will keep growing out of control, so the mass panic appears. Common physical appearance of mass panic is crushing, trampling, jumping into water or jumping out of a high-rise building, which will never happen under normal evacuation scenarios.

Most people relate panic to crowd behavior, without realizing that individual can also shows panic behavior under certain conditions. In order for the individual panic to happen, the necessary conditions include an environment (external), a belief (internal), and a trigger (connection). Here we can check these factors one by one.

The environment leading to a potential problem can be generalized as confinement. This confinement can be a building, an examination, a financial condition, a dark environment or the crowd itself. Smelser (1963) used structural conduciveness to emphasis some structures prone to a disaster. Here a less strict definition is used for confinement, as panic can happen everywhere. Confinement is a danger, since the occupants have the possibility of being trapped. This perception anxiety is trivial under normal conditions, but will grow if the egress capacity is also limited and more people than expected are present. Crowd itself is a kind of confinement. If the crowd density is high, the freedom of movement is limited and the personal safety is threatened. During the night without enough lighting, the darkness is another form of confinement acting on the participants. This is the reason that many stampede events happen at night due to poor lighting conditions. Britton (1972) stress the environmental factors by proposing adequate exits as panic antidotes. Quarantelli's observation (1976) on panic behavior confirmed the fact that a person seeing exits will not panic.

The next factor is a belief on the potential danger. Smelser (1963) used 'a hysterical belief', which over-stated the panic level. Here are two extremes. If this belief is too strong, the person tends to over-react to a threat, so his panic behavior is more significant than others. If this belief is too weak, the person tends to ignore the dangers around. But once he realized something wrong and take actions out of instinct, he will over-react by taking extreme actions. The ignorant people tend to follow others, a magnifying factor in a panic. This is the reason that children tend to be more panic-prone than other age groups. This is also the reason that the animal herds are subject to easy panic, because they have little memory and almost no communication between each other. Some groups are more panic-prone than others due to their belief or knowledge level. Females, children, aged, mobility-impaired react more violently in a crowd disasters, as they are easy victims of panic. Fatigue is also one of the important factors on initiating the panic flight in the military scenario (Boring, 1945)

The panic level grows much faster in those strong believers and those knowing-nothing attendants. In other words, the panic level increases faster under extreme conditions of a certain belief on a potential danger. In addition, a person's perception capability may be reduced by some special conditions, such as alcohol, late night exhaustion, and awakening from a concentration. The weakened perception will reduce the owners' reasoning capability, so they are easy targets of panic emotions. The best example for this factor is the Italian Hall Disaster (64 dead), which happened in a Christmas party for miners and their children. Those miners were extremely sensitive to fire (professional fear to them) while their kids were insensitive to the potential danger. When a false warning "Fire" was heard, both reacted violently, which led to a stampede for a non-existent danger. The danger of a certain belief was dormant in their mind until other factors aroused the panic response. Similarly, the victims of Iroquois theater fire were predominantly women and children. They were easy to grow panic, especially when the egress system was flawed (Chertkoff, et al. 1999).

The third factor is a triggering event. Smelser (1963) call it a precipitating factor. Usually it happens suddenly without enough time to let patrons realize what is happening. It is a connection between the existing (external) environment and the (internal) belief. This event can be momentous, such as an earthquake or any structure failure, or trivial, such as a cry 'fire'. The result of such a stimulus depends on the dormant belief and the anxiety level, so the exciting level spans a wide range depending on the previous two factors, especially the belief. Fire is the single most common initiator for panic behavior, due to the unpredictable flame spread rate and the irritation from the fire products. Some people have not enough experience with fire, and they tend to underestimate the flame spread rate in the beginning and overestimate the rate in the later stage. The global result is that they get frightened or panicked suddenly if they saw something unexpected. Iroquois theater fire is a typical example in this category.

The above three factors are enough to generate speeding flight behavior, such as the evacuation behavior in an earthquake and the flight from World Trade Center after the terrorist attack. Quarantelli (1976) described six features of (individual) panic behavior, but this behavior is not the mass panic normally interested by fire protection engineers. Sometimes, a certain level of individual panic is encouraged, as it helps the patrons to make an early

decision to move. Once the triggering event is gone, the crowd may settle down and return to the normal mode from (individual) panic behavior. If this returning process is interrupted by another event(s), such (an) enforcing event(s) will push the participants side-tracked from their normal (predictable or orderly) flight behavior and grow into a chaotic and frenzy behavior, characterized by mass panic.

In order for individual panic to grow into mass panic, further enforcing events are needed, together with interactions with external social feedback. Time is a measure of the contributions of these two factors. So the occurrence of mass panic needs three additional factors: enforcement, external feedback and time.

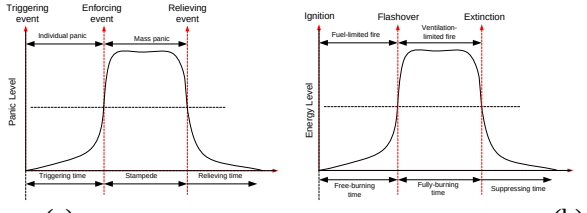
Each person can make a wrong decision at the triggering event, but soon he will calm down and readjust his decisions toward more realistic choices. If a second or more events happen, it will interfere with the first event, causing confusion among the participants. These passive information receivers will have no time to collect enough information about these events, so wrong decisions will be initiated or continued. Usually, the secondary event is caused by and enforcing the first one on initiating a disaster. This enforcement can be continuous (such as the gradual flame spread), or intermittent (such as the handrail break down under the pressure of a crowd.) The enforcing event may not be really life-threatening, but the receivers have no time to find out the truth, so the result is disastrous. The idea of enforcement was first proposed to explain the fatigue-induced panic in a military scenario (Boring, 1945).

Generally, the panicked crowd could not recover from series of events easily, which shows the importance of the external feedback. The self-saving can only be accomplished when everybody realized the dangerous situation, and started to take actions simultaneously. This is the case when the crowd density was dangerously high, shouts of “remain calm”, “don’t panic” heard above the confusion have undoubted been effective in minimizing or averting human disasters (Russell, 2007). However, this is not the case during most crowd-related disasters. In these cases, it is almost impossible for the participants to recover themselves. The death cause in a stampede is mainly asphyxia, which is very time-sensitive. The sooner the intervention, the smaller is the life loss. Prompt and affirmative measure should be taken to prevent the situation from deteriorating.

This feedback can be positive or negative. If the external social relief is helpful in reducing the tension in the crowd, it is negative to the panic growth. If the external feedback is exciting the crowd like an additional enforcing event, then the panic level will be boosted. In some crowd events, such as 2003 E2 Nightclub Stampede, the police tried to control the riot using pepper or teargas, which excited the existing level of panic, and the disaster follows. How to control the panic and suppress aggressive behavior is a constant topic in legal enforcement. The stampede in Mexico disco club (12 dead) was a typical case of failed social control, where the police intervention provided a positive feedback to the crowd and made the matter worse.

Finally, the interaction of all previous factors is happening within a time constraint. If the time interval between the triggering and the enforcing is too long or the occurrence is frequent, the crowd will have a learned response toward external stimuli. This is the case of Japanese civilians under firestorm attacks in World War II (Clarke, 2002). There was little observation on mass panic, since the residents were used to such a form of attack and desperate to it. Panic only appears in the first several tries while the learned experience will prevent individual panic from further development. For the mass panic to grow, the exciting events are supposed to happen at small intervals, so the receivers have no time to response correctly and rationally. Other famous non-mass-panic cases include: WTC bombing (1993), Titanic sinking (1908), and Invasion from Mars (1938). They are all missing enforcing events or having long intervals, so the time factor is also missing. Without these two factors, the individual panic could not grow into mass panic. Ozel (2001) and Sime (2001) stressed time factor in their analysis of disasters.

In the temporal domain, the panic level growth curve is shown in figure 2(a). Note that the panic level is inferred and not directly measureable. However, it is a kind of potential to make wrong decisions, so it can be equivalent to an energy potential term in figure 2(b). The plateau is relatively flat, since the crushing and trampling will not increase the local crowd density. Globally, the danger imposed by the environment is still the same, so there is a saturation level of mass panic. The panic level will decay only when most living creatures are exhausted or dead (like a fire running out of fuel), or the external control takes on its role (like suppressant in action).



(a) (b)

Figure 2. The analogy between the panic growth model (a) and a fire growth model (b)

The panic growth model is analogous to the compartment fire growth model, with is also shown in Figure 2 (b). After ignition, the fire will experience the free-burning stage and the fully-burning stage. The extinction will take place when the fire is running out of fuel or the suppressant is in place functioning. Without external intervention, the fire will not decay with fresh fuel still available.

Comparing these two models, we can find that this definition of panic is close to the classical definition of entropy in thermodynamics, as it is a measure of disorganization in the crowd.

Under a small level of panic, or anxiety, the crowd will simply move faster, and the disorganization is small and hidden in each individual's mind. When the density level or disorganization level reach a certain point, the panic level grows sharply, and the improper egress behaviors happen under such a panic situation. This will leads to disastrous results, such as jumping (e.g. World Trade Center Terrorism attack and fire), drowning (e.g. Iraq rumor-induced Bridge Stampede), crush (e.g. Hillsborough disaster), and stampede (e.g. Love Parade Stampede). Note that the panic itself will not lead to disaster directly, but the panicked crowd members cannot make right decisions under emergency, so the evacuation process creates disastrous results. Any crowd disaster is the result of non-optimum evacuation process, so with a partial contribution from panic. Here panic is merely a catalyst instead of a direct contributor.

This panic model is similar to Smelser' value-added theory, but used for crowd safety applications. A comparison with the original model and Fruin's crowd-disaster theory is shown in figure 3. Fruin's theory is not focused on panic, but since panic plays a major role in causing wrong decisions in a live-or-die scenario, his elements can be also compared here.

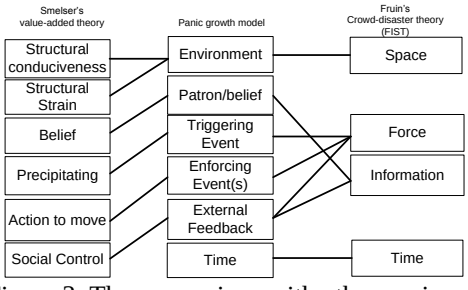


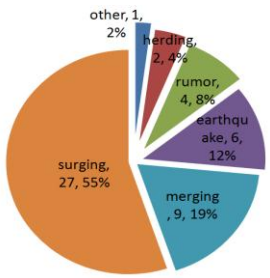
Figure 3. The comparison with other panic models

Comparing with Smelser's model, this model stresses the dynamical features of a crowd disaster by using three events and a time factor. The validity of all events on exciting a panic is dependent on the time factor. The excitation should happen at the right place (environment), to the right people (patron with a certain belief), at the right time and in the right way (triggering, responses and external control) to bring about a disaster. The abstract terms in Smelser's theory are given clear meanings in the scenarios of a crowd.

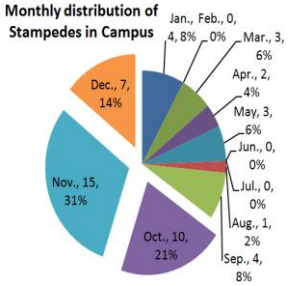
Comparing with Fruin's FIST model, this model also stresses the dynamic evolution of a panic. The flow of forces and information is converted into clearly-defined events and responses. So the dynamic process can be better understood, along with the help of a panic growth curve.

CASE STUDIES

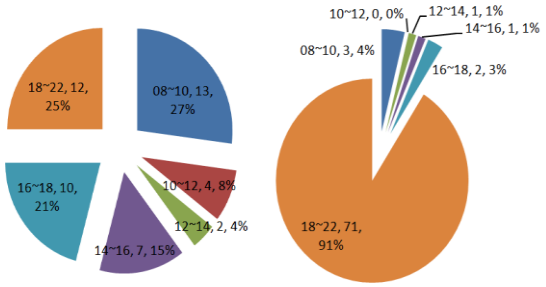
Between the year 2000 and 2010, there were 48 campus stampedes in Chinese schools. Except one case due to the collapse of balcony handrails, 47 happened in stairwells, especially the stair connecting the first floor to the ground floor. Figure 4(a) shows the distribution of triggering events, with more than 55% due to surging. Surging means all patrons start to move at the same time. The monthly distribution of stampedes tells the clue to panic initiation. In Figure 4(b), about 2/3 cases happened in the fall, showing the role of human resistance on initiating a stampede. Generally, there is no air conditioning in Chinese classrooms, so the clothing changes sharply in the fall. The added body resistance plus the unchanged moving habits, is the main reason for initiating stampede in stairwells. In addition, all stairwell capacity is under-designed due to inadequacy in building codes. For the victims of the campus stampede, they are predominantly young, mostly under fourteen. So the environmental factor is the background, and the population provides the easy victims, while the triggering events can be very small. In this case, they are surging (start moving at the same time), merging flow (including counter flow), herding (uneven use of existing capacity), earthquake (unexpectedness) and rumor (false belief in the crowd). Panic was initiated due to either local crowd density or unexpectedness (earthquake or rumor).



(a) Triggering events



(b) Time in a year



(c) Time in a day (d) Fatalities distribution in a day

Figure 4. Distribution of campus stampedes in China

Figure 4(c) and (d) are checking the time factor in the panic model. While the occurring time is quite random in a day (Figure 4(c)), the fatalities are predominantly happened during the night (Figure 6(d)), showing the impact of external feedback on relieving the situation in time. A patron in panic situation cannot relieve himself from the entrapment. Without external help, the fatalities will precipitate once started. This is the nature of all crowd-related disasters, since mass panic is contagious and precipitating.

According to Helbing et al. (2000), people show a tendency towards mass behavior, that is, to do what other people do when the level of mass panic is reached. That means the agent forces cancel each other and the crowd flow rate is reduced to zero once mass panic dominates. To reproduce (simulate) a crowd disaster, we need to determine when and how the panic level reach the level of mass panic.

DISCUSSIONS

This work finds some utilities of panic in simulating a crowd disaster, however, the mainstream idea in FPE community is that panic is rare. An unavoidable obstacle for a panic theory is the gap between reality and theory. Here are several reasons contributing to this gap.

Most researchers stress the psychological feature of panic. So they use panic as the cause of a tragedy. This is not true, as panic is not a paraphrase or replacement for stampede or crush. Some researcher tried to find panics instead of stampede or crush without success. To them, any crowd-disaster without obvious reasons (such as crush or stampede) may be the result of panic. So Sime (1980) believe panic is a concept commonly used for scapegoating. Here panic is a catalyst, making a bad situation worse, while all life losses have their own direct and specific reasons. So panic is not a counter-part for causes of a disaster. It evolves along with other causes of life losses.

Panic is a cultural and linguistic concept. As Rogsch et al. (2008) pointed out, panic is used more in German media than in English media, as stampede is reserved for a group of big mammals only in German. In Chinese, panic is an emotion similar to stressful and disorder in mind, so it is neither good nor bad. A small panic facilitates the decision process to evacuate, while extreme panic leads to competitive behavior and disastrous results. In this perspective, panic is close to anxiety or disorder. The author of the book *the Art of War*, Sun Tzu, is promoting the idea of controlling panic by more discipline and additional training. To him, panic is equivalent to disorganization both in outlook and in mind.

Panic is a growing concept. Most researchers use the orderly evacuation in the beginning stage in Beverly Hills Supper Club Fire for no evidence of panic (Sime, 1980, Clarke, 2006, Proulx et al, 2009). However, with the fire and smoke entering Cabaret room, competitive evacuation behavior developed near the exit and in the last few minutes, so panic came in a later stage. Similarly, Station Nightclub fire developed some competitive behavior (panic by definition in this work) when the surviving chances were slim for those trapped.

Rationality is a relative concept in social science, as Smelser (1998) pointed out in his keynote address. All behavior in evacuation is rational to the patron himself. Some rational behaviors are non-rational and non-adaptive to the group as a whole. Rationality alone is insufficient to identify panic (Quarantelli, 1975).

Panic is a spontaneous response, while false alarms, historical disasters in the news, disaster movie, and fire drills are refreshing our memory on disasters and shaping our response toward an alarm. Now, a shout 'fire!' may not produce the shocking effect in Italian Hall disaster (1913, 64 dead). False alarms are forcing occupants to hesitate and wait for additional clues, while inexperienced people are still panic-prone. For this reason, crowd disasters are more happening in developing countries, as their facilities are insufficient, the population is un-knowledgeable about potential risks and the rescuing force is inexperienced.

Panic can only be deduced from the results (Sime, 1980), while most researchers tried to observe panic in a direct way (Drury, 2006). This strategy does not work, since panic affect the result through the decision making process, not working directly on fatalities. All life losses have direct reasons, while mass panic plays a catalytic role in precipitating the disastrous results.

CONCLUSIONS

Though panic is rare, panic is not rare in crowd disasters using the new definition in this work. Here panic as disorganization due to fear is a weak definition, stressing the outlook instead the

psychological side of panic. The result of a crowd disaster is not based on panic, but on panic-related decision-making process. By defining two stages of panic growth, a six-element model is proposed for panic growth. This model is useful in diagnosing what went wrong in a crowd scenario. The panic growth curve in temporal domain stresses the time factor in leading to a major disaster. The panic growth model in both forms will help crowd managers to define the situation and take precautionary measures against mass panic.

From the 48 campus stampedes in China, the variation of body forces (reflected in clothing) is found to contribute to a crowd disaster, while the environmental factor and the population/belief play a role on initiating a disaster. This panic model is helpful to identify when mass panic occurs, so the existing panic algorithm by Helbing et al. (2000) can be switched on for simulating the crowd disaster.

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Appendix: Summary of classical definitions.

	Definition	Source	Stress
1	Panic is the crowd in dissolution.	Park, R.E., Burgess, E.W. (1924)	Physical
2	Panic behavior is the antithesis of regimental behavior, uncoordinated interaction with unpredictable consequences.	LaPierre, R.T. (1938)	Physical
3	Panic is a type of rout, an ephemeral form of collective behavior. Panic develops through the "linkage of a shock stimulus and four phases of human reaction to this stimulus".	Foreman, P. (1953)	Physical
4	Panic is an acute fear reaction marked by loss of self-control, followed by "non-social and non-rational flight".	Quarantelli, E.L. (1954)	Emotional & physical
5	Panic is a collective retreat from group goals into a state of extreme 'privatization'.	Lang, K., Lang, G.E. (1961)	Emotional
6	Panic is a collective flight based on a hysterical belief, a belief that a definite threat is present and that escape routes are closing.	Smelser (1963)	Physical & emotional
7	Panic is a reaction involving terror, confusion and irrational behavior, precipitated by a threatening situation.	Goldenson (1984)	Emotional
8	The word panic if often applied to a strictly individual, maladaptive reaction of flight, immobility, or disorganization stemming from intense fear. Individual panic frequently occurs as a unique individual response without triggering a similar reaction to others. Panic as collective behavior, however, is shared behavior.	Nolan, D.P. (2006)	Physical
9	General public believe that irrational flight is at the heart of panic behavior. Many theorists have characterized panic as terror stricken, irrational, flight behavior where the rule is "every man for himself". In sociology, precipitate and irrational actions of a group are often referenced to as panics	Russell, G.W, (2008)	Emotional
10	A sudden, overpowering terror, often affecting many people at once.	The free dictionary, online	Emotional
11	A sudden overpowering fright; acute extreme anxiety	Merriam Webster Online dictionary	Emotional
12	A sudden strong feeling of fear that prevents reasonable thought or action.	Medical Online dictionary	Emotional
13	The word panic is often applied to a strictly individual, maladaptive reaction of flight, immobility, or disorganization stemming from intense fear.	Encyclopedia Britannica (2008)	Emotional
14	Panic is a sudden fear which dominates or replaces thinking and often affects groups of people or animals.	Wikipedia (2011)	Emotional
15	Panic is a sudden overpowering fright, especially a sudden terror often inspired by a trifling cause or a misapprehension of danger and accompanied by unreasoning or frantic efforts to secure safety.	Oxford dictionary	Emotional