

Humor Techniques: From Real World and Game Environments to Smart Environments

Anton Nijholt^(✉)

Faculty EEMCS, Human Media Interaction, University of Twente,
PO Box 217, Enschede, The Netherlands
anijholt@cs.utwente.nl

Abstract. In this paper we explore how future smart environments can be given a sense of humor. Humor requires smartness. Entering witty remarks in a conversation requires understanding of the conversation, the conversational partner, the context and the history of the conversation. We can try to model interaction smartness and how to use it in creating not only witty remarks, but also to create humorous events. Smart sensors and actuators, embedded in our environments and our wearables allow us to make changes to a digitally enhanced physical environment. Witty remarks in language can have their counterpart in witty events in digital environments, including social media environments with their own communication characteristics. Sequential and parallel juxtapositions of incongruous and contrasting events invade our communication and, in addition, can be expected to emerge or to be created in digitally enhanced physical environments too, accidentally and intentionally.

Keywords: Incongruity humor · Computational humor · Intended humor · Accidental humor · Sense of humor · Ambient intelligence · Internet of things

1 Introduction

Humor is universal, but different cultures have different kinds of humor. Humor has different functions. When we look at existing humor theories the incongruity theory focuses on the cognitive effort to understand humor, the superiority theory is about how we experience humor, and the relief theory is about the function of humor [1]. Relief theory, introduced by Sigmund Freud [2], tells us that jokes help us to release tension and allows us to suppress emotional censors, hence, allowing us to include taboos in a conversation. Minsky [3] talked about the suppression of cognitive sensors and in later years also the suppression of social censors were mentioned, for example by Junco [4], in his observations on cartoon humor.

Almost all humor researchers focus on verbal humor and jokes. Language is not the only tool that can be used to create humor. In our daily life we often encounter situations that make us laugh and that we consider to be humorous. It certainly may be the case that also in these situations protest against social censors plays a role, however, in our research we just assume that people, for whatever reason, like to get amused by

humor. When looking at digital technology, can it help in providing conditions that lead or are expected to lead to humorous situations? Think of ‘practical jokes’ that are performed in the physical world and that make use of ‘building blocks’ provided by the environment. But there can also be lots of humorous situations emerging because of wrong expectations, unusual behavior, or failure to deal with a situation. This design of humor is exploited in comedy writing, whether it is on stage, on television, or in movies, for example the silent movies of the beginning of the twentieth century. Our traditional natural, physical environments, and the people that inhabit them, can of course not be controlled in a way that compares with the way a movie or stage director can control a physical environment, its inhabitants (the actors) and events that are designed to happen there. Our hypothesis is that this will change. Users will have more control of their environment. Obviously, they already have devices that allow them to control aspects of their house and garden. Or devices that assist them in controlling their health or intended changes of behavior, such as doing more sports. They can maintain and control their social life by being active on social media. But, when we continue to increase the numbers of sensors and actuators in our daily environments we can expect to be able to use them for humor creation just as we can use words, speech, and prosody for verbal humor generation.

The aim of this paper is to support this hypothesis by surveying the possible ways humor can appear in smart environments. The focus is on nonverbal humor, that is, humorous behavior and humorous events. Unfortunately, most of the humor research is on verbal humor, so, we need to spend time on surveying what has been said about nonverbal humor in the past and we need to discuss whether observations from earlier research, not taking into account digital technology, can be used for our purposes. But we can also look at nonverbal humor in situations where the user (audience member) can just watch and enjoy what is presented to him or her: a stand-up comedian, a silent movie, a sitcom, a comedy on stage? What kind of humorous events are constructed there? Can we design similar humorous events in smart environments? One step closer to smart environments are game environments, in particular videogames. Here the user (gamer) has an active role. She can interact with the game environment and her behavior and decisions will have impact on her experience of the humor that has been designed in the game. In particular when we adhere to the view that our society will become more gamified, we probably can learn from the way humor has been integrated in game design. There are also examples where videogames have been given an implementation in the physical world, where digitally augmented and controlled human players represent the avatars in a particular videogame.

The organization of this paper is as follows. In Sect. 2 we have a preliminary discussion on the various forms of digital humor that can appear in smart environments. In particular we distinguish between accidental and intended humor, and possibilities to increase accidental humor. Section 3 has observations on verbal and nonverbal humor with the aim to inspire thoughts about introducing humor in smart environments. Unfortunately we have to leave out many useful observations that are available in the literature on comedy writing, sight gags in movies and explanations of humor in sitcoms. In Sect. 4 we discuss videogames and humor. Section 5 summarizes our observations from the point of view of smart environments and provides some concluding remarks.

2 Humor in Smart Environments: Senses of Humor?

In smart environments we can use our smart devices and the environment, whether it is the environment that physically surrounds us or our social media network that virtually surrounds us, can assist us in our needs and activities, whether they are work, health, recreational, mood, or socially related. There is not always need to use devices, the environment can monitor and interpret our behavior and can decide to be pro-active, take the initiative, and suggest, persuade or force the user to perform certain actions. Obviously, there can be more friendly and humorous interaction between environment and user too. That is, we can have human-human-like interactions with the environment and with its digital devices (wearables, tangibles, virtual pets) and other inhabitants (social robots, virtual and holographic humans, digitally augmented humans). Devices and inhabitants should allow humorous interactions, taking into account and using the context and the history of interaction [5]. Some related research is already performed. For example, interpreting various forms of laughter and generating various forms of laughter are research topics that aim at providing virtual humans with non-verbal speech characteristics [6]. Other research aims at providing social robots with the ability to recognize or generate humorous remarks or jokes in a conversation [7]. Clearly, this research requires knowledge of what is happening nowadays in computational linguistic research on dialogue modelling and dialogue management.

Humor in smart environments can occur in interaction with social robots, digital pets, virtual humans, interactive products, and whatever the smart environment has to offer. When humor is introduced in such interactions it is meant to be intended humor. But not all humor that we experience is intended. We can make innocent remarks that turn out to be humorous. The shortness of newspaper headings introduces ambiguities that allow humorous interpretations. We often laugh about the errors we make. Digital technology is not always that perfect either. We can sometimes laugh about failures of digital technology, or about people that are confronted with new digital technology and are unsuccessful in using it. It is also possible to explore imperfections of digital technology in digital environments to create humorous situations. Hence, when discussing humor in smart environments we need to look at both intended and unintended humor. Unintended humor can appear when technology fails, when technology is not understood and someone tries unsuccessfully to interact with this technology. Technology failures or possible misunderstandings arising from new technology can also be exploited to generate intended humor. For example, gamers exploit imperfections in game engines in order to create, record and edit humorous events using in-built or external editors [8].

Accidental humor and ways to increase occurrences of accidental humor in smart environments is an interesting approach to humor in smart environments. We will return to this view later. But in addition to increasing the possibility of accidental humor, for example by creating incongruous situations in smart environments, we would like to investigate intended humor, humor that is created and controlled, either by the environment or by an inhabitant (human, social robot, virtual pet, furniture, walls, et cetera) of the environment.

In smart environments sensors and actuators can be controlled and can be configured in order to facilitate humor generation. This can be done by those that own or

maintain our smart environments. Depending on how much control is left for the environment's inhabitants, it can be done by its human inhabitants using available interfaces, including wearables, to control, configure and play with the environment and prepare it for a digital practical joke. In this way we can distinguish a 'weak' sense of humor and a 'strong' sense of humor. In the 'weak' sense the human or digital practical joker sets up unexpected and surprising events, but not yet necessarily humorous. Suggestions for such events can be given by the environment to the human joker or partly performed by the environment itself. In the 'strong' sense it is assumed that the environment has a sense of humor that allows it to autonomously generate humorous incongruities in the digital and/or digitally enhanced physical environment. Clearly, there is a continuum from the weak variant to the strong variant where there is a decreasing involvement of a human joker and an increasing involvement of the smart and playful environment that takes care of humorous event generation. This continuum allows the introduction of degrees of sense of humor.

Unfortunately, sense of humor – involving both creation and appreciation of humor – is hard to quantify [9], let alone, hard to model. That is, controlling humor settings for robots as is suggested in the 2014/15 *Interstellar* movie is still some years away. Nevertheless we can think of environments that more or less are receptive to humor appreciation and generation. Being able to control the humor level of smart environments is an important issue, but as well important is to have some consistency in the kind of humor that is generated. We can think of environments or their non-human inhabitants and devices as having some kind of personality and their humor should meet their artificial personality characteristics.

Humor styles associated with personality characteristics have been identified [10]. There is the affiliate style (meant to enhance the relationship with others), the self-enhancing style (related to an optimistic view on circumstances and life in general), the aggressive style (potentially detrimental towards others), and the self-defeating style (potentially detrimental towards the self). When designing smart environments with a sense of humor it is useful to know when what kind of style is useful, keeping into mind that some consistency in humor creation and appreciation is required.

Another issue that can be addressed is the quality of humor that is created by a smart environment or its users. Can we and do we want to distinguish between bad quality and good-quality humor? The aesthetics of humor has been discussed by John Morreall [11]. Criticism on his views appeared in [12]. At this moment there is hardly a way to embed such notions (sense of humor, styles of humor, and quality of humor) in the design of humorous smart environments. But, obviously, when designing future smart environments, these notions should be kept in mind and should appear in the design, even if it is in a rudimentary form.

3 Verbal and Nonverbal Interaction Humor

In texts, for example in verbal jokes, incongruity humor is introduced by a stereo-type set-up of a situation that, although it is ambiguous, its ambiguity is only recognized when the next text lines or a punch line introduces additional, non-stereotypical dis-ambiguating information to the listener or reader of a joke. The listener or reader

understands that he or she has been fooled. There is a cognitive shift involved; one interpretation has to be exchanged with a second interpretation. And, moreover, this second interpretation often requires an unusual view of the world, a view that is not in accordance with what we assume to be appropriate, morally acceptable, logical, or physically possible. This incongruity humor research follows the interests of language researchers interested in non-literal language use, in irony, in sarcasm, and humorous utterances, whether they are part of conversations, texts, or part of joke telling. That is, traditional humor researchers focus on language and expect their linguistic techniques, sometimes supplemented with artificial intelligence techniques, to provide answers to questions why a particular text, a joke, or a particular conversational act, can be considered to be humorous.

3.1 Humor in Conversations

We use humor in conversations. For example, we can do it to humor our partner, to deal with disappointment, to catch attention or to smooth down a heated discussion. During parties and other informal gatherings we sometimes enter a situation where there is an accumulation of witty remarks. There is humor, but not by telling jokes. It is spontaneous and its ingredients are taken from the situation.

Often we see the possibility to make a humorous remark by given an incongruous (illogical, inappropriate, absurd, ...) turn to a discussion or make a remark that is based on an intentional wrong and absurd interpretation of a preceding remark. In order to do so we need a relation between our witty remark and the context in which this remark is made. With context we mean the conversation so far, knowledge about the conversational partners, or events happening during the conversation, for example, watching a sports game or ordering drinks. Knowledge of this context makes it possible to make implicit or explicit reference to it and at the same time distorting it.

Obviously, in smart environments we can expect to have conversations and interactions with the environment and its artificial inhabitants such as virtual humans, social robots or pets. Unlike the usual approaches to textual humor, focusing on analysis, this requires humor generation, that is, as outlined above, humorous use of the knowledge about the dialogue so far and the context in which it takes place. Two examples for the case of virtual agents are:

- Elmo is a chatterbot-like agent [13] that lives in a virtual world where it can assist human users that have questions about this world. The chatterbot is integrated with JAPE, a pun generating system [14]. Using keywords (or WordNet synonyms) from a user's input, Elmo searches the JAPE database and can add a punning riddle to an answer.
- More sophisticated linguistic techniques (syntactic analysis of the user's input, applying reference resolution techniques, using ConceptNet) are used in [15] in an attempt to generate humor by purposely using a wrong antecedent of an anaphor, preferably an antecedent that opposes properties of the real antecedent.

There are some modest attempts to investigate the use of humor by social robots. For example, doing Wizard-of-Oz experiments in order to look at the effect of a robot's

nonverbal behavior on humor appreciation. A robot butler with funny interaction behavior was introduced in [16]. Using principles from verbal humor and getting inspiration from movies about robots (WALL-E) and butlers ('Dinner for One'), they looked at funny ways for the robot butler to deliver objects and hand them over.

Virtual humans or social robots interacting with their human partners have to update their view of the world (new knowledge follows from the interaction) and due to their interactions they may want or are commanded to make changes in their virtual and physical world. Virtual humans and social robots are integrated with their environments, we can ask a virtual human to turn off the light when we leave a room and we can ask a domestic robot to provide information about his activities to an environment monitored by a virtual human. Virtual humans and social robots can make changes to their environments. When they have a sense of humor, they can provide a human partner with suggestions about a next configuration of their worlds that allows him or her to introduce a humorous event. And, as mentioned when we introduced the humor continuum in Sect. 2, there can be a cooperative decision with a human partner, but also an autonomous decision by a smart environment (and its digital inhabitants) to make a humorous event happen.

3.2 Humorous Events

In the discussion above we focused on the humor intelligence of virtual humans and social robots and how it can play a role in face-to-face interaction. A broader view is needed. There are also many situations in real life that amuse us, make us smile or make us laugh. There is no way yet that we can formalize such situations and have algorithms that decide when and how we find pleasure and enjoy a particular event. However, this does not mean that we cannot have incongruities introduced by smart technology into our lives. Such incongruities will not necessarily lead to humorous situations. Incongruities can be confusing or even threatening, but here we assume that when we are aware of potential incongruities we can understand and manipulate them to introduce humorous situations. So we can ask how we can control an environment and its virtual and human inhabitants, making use of sensors and actuators embedded in these inhabitants (e.g. using wearables or implants) and in other devices and objects in the environment, to generate humorous events. What kind of digital banana peel can we introduce in a smart environment?

Incongruity humor theories seem to be the most promising approach to the 'digital banana peel' problem. This approach may assume a view on a particular situation that has to be replaced by a different and surprising new view because of newly obtained information about that situation. Surprising, because it is in contrast with our initial interpretation of the situation. This is comparable to when someone tells us a joke or when we read a text that is ambiguous and later we realize that although at that moment our interpretation best fitted a stereotypical interpretation, the situation's description also allowed a less stereotypical and very much contrasting interpretation. However, in non-text humor, whether it is in cartoons, movies, stage performances or real life, different interpretations of a particular situation do not necessarily follow from a succession of events. It is as in a cartoon, where we see drawing and text at the same

time, although there can be differences in ‘scanning behavior’ of a cartoon. In a similar way we use our senses to interpret an event in real life and become aware of incongruities. Unlike cartoons, we don’t think that a snapshot of a humorous real-life event will turn out to be humorous. The dynamics of the event have to be taken into account. And, unless the single-modal incongruities that can appear in language, in the physical world we can have cross-modal incongruities, where our senses reach a conclusion, based on partly incomplete and partly conflicting information, that later has to be revised based on newly received information. We have been ‘tricked’.

As the authors of [16] mention, there is no theory of funny behavior. They are right, but indeed, as they argue, there are principles from verbal humor that we can turn to and there is a wealth of funny behavior and funny events in movies and comedy that have been analyzed. There exist also many interesting observations on humor in daily life and there are some typologies for humor as it can appear in ‘real’ life. Clearly, ‘real’ life nowadays is different from ‘real’ life as we know it from twenty-five years ago when neither Internet, World Wide Web or mobile devices were integrated in our daily life. Existing typologies are however from the pre-Internet period and mostly focus on verbal humor or, when sight gags in movies are discussed, from the pre-‘talkies’ period. Noel Carroll [17] in his taxonomy of sight gags gives many examples of juxtaposition of incongruous elements in such movies. They include ‘switch images’, where an event is presented to the audience under one interpretation, but where subsequent information, for example obtained with a different camera view, makes clear that the situation was underdetermined and should have been given a different interpretation. They also include ‘the mutual interference or interpenetration of two (or more) series of events (or scenarios), an incongruity also introduced by the French philosopher and Noble prize winner Henri Bergson in his essay on laughter [18]. Bergson looked at humor in (French) comedy, but by doing so he had many observations on humor in real life situations with explanations that emphasized a ‘mechanical’ interpretation of events and human behavior in order to be considered humorous. Also accidental humor, following from thoughtlessness and not being able to deal with unexpected situations, is included in this ‘mechanical’ viewpoint (see also Nijholt [19]).

If we turn to humor researchers then, in Berger [20] we can find four basic categories of humor techniques: Language (the humor is verbal), Logic (the humor is ideational), Identity (the humor is existential), and Action (the humor is physical or nonverbal). The latter category only contains the techniques ‘Chase’, ‘Slapstick’, ‘Speed’, and ‘Time’, while the other categories all have more than ten techniques. But although illustrations of techniques usually address jokes, there are some techniques from other categories (for example, mimicry and impersonation) that can be used beyond language. This typology has been adapted in [21] for audiovisual media with the aim to use it to analyze humor in TV commercials. To answer the question what it is that generates humor in media they studied hundreds of commercials and seven humor technique categories were distinguished: (1) slapstick, (2) clownesque humor, (3) surprise, (4) misunderstanding, (5) irony, (6) satire and (7) parody.

Another useful typology has been introduced by Morreal [22]. We summarize his views, with a bias towards our interest in nonverbal humor that can be generated in smart environments as follows:

- Deficiency in an object or person. This is about physical deformity, ignorance or stupidity, moral shortcomings, or actions that fail. Hence, it is about inferiority, weakness and absentmindedness.
- One thing/situation seeming to be another. This is about mimicry/imitation, imposter, pretense, and mistaken identity, but also about giving different and opposing interpretations of events.
- Coincidence in things/situations. Everywhere we expect uniqueness unexpected repetition can have a humorous effect.
- Incongruous juxtaposition. The incongruous effect is obtained by having physical, social, and psychological opposites appear together in a situation.
- Presence of objects, people, behavior, opinions in appropriate situations. This includes situations where sequences of events inappropriately intersect.

With our aim to introduce humor in smart environments, whether it is done by a human, the environment itself or by a joint effort of human and environment, tools to realize these techniques using sensors and actuators need to be made available for a human joker, a controller of the environment or for the smart environment itself.

4 From Videogames to Smart Environments

Interestingly, there now are videogames that have been given an implementation in the digitally enhanced real world. That is, sensors and actuators make it possible to have playful and game-like experiences in smart environments. It is worthwhile to investigate videogames and how gamers use the virtual environments that are offered by the game companies. Unlike the passive listening and seeing experience when someone tells us a joke, when we watch a sitcom or a humorous TV commercial, when we watch a stage performance, or when we watch a movie, videogames are about interaction. In principle, a user's interactions are anticipated, including the many ways a user can fail to perform a certain interaction. Game designers, maybe not the designers of shooting games, have introduced humor in games, for example in adventure games, games where users have to exploit the environment and have to make decisions about how to continue, and while doing so get humorous commentary and sometimes are confronted with humorous actions of the non-playing characters (NPCs) or humorous behavior of the environment. In some games players are challenged, sometimes implicitly, to reach a goal as fast as possible. Other games can be played more leisurely and allow relaxed social interaction. In massively multiplayer online role-playing games (MMORPGs) we have teams of players that discuss strategies and try to humiliate and destroy opponents, preferring creative and humorous ways to do so.

Game designers do not systematically use humor techniques to design humor in a game, that is, in games we can recognize such techniques, but they have been introduced by a designer using his sense of humor and his intuition when and where to use it. In [23] a first attempt is made to offer game designers 'design patterns' that can help them to design comical game characters and events. Because at this moment there is not sufficient artificial intelligence that allows situation-aware autonomous behavior of NPCs, it is almost impossible to give them an active role in attempts to create

spontaneous humor in games. Rather than canned or scripted humor and just as in the case of the human-robot interaction humor we discussed in Sect. 3, we would like to see situational humor.

Although it is not spontaneous, in good games ‘canned’ humor is as much integrated as it is the case with the sounds and music that accompany the game. Situational humor can be introduced in MMORPGs by human players without NPCs or game environment being aware of this humor and without a game designer intentionally having facilitated this kind of humor. We enter a grey area between canned humor and situational humor when the game designer introduces ‘laws’ in a physical engine that do not match with what we are used to in our daily life environments. Maybe we can walk through walls, see through walls, become invisible, or have eyes in the back of our head. Having unusual game physics, weird shortcuts, non-Euclidean geometries, intriguing perspective play and other surprising game elements (e.g., the use of panels and the portal mechanics in the *Portal* game) will certainly help to enter or introduce humorous situations during game play. Without verbal commentary such humorous situations can be recognized and we can consider this as intentional attempts of a game designer to introduce non-scripted humorous situations in a game. In order to make smart environments humorous we can make use of these videogame ‘techniques’. They add to the techniques that were mentioned in the previous section. No systematic exploration of such techniques has been done so far.

There are more ways in which humor from videogame environments can be translated to humor in smart environments. In games we can encounter hackers, cheaters and gamers whose play is not (game) goal-oriented but rather to the exploitation of a game to see where things can go wrong and where you can be cleverer than the designers of the game. The general idea is that a game designer cannot anticipate every action a gamer can take and therefore cannot always choose an appropriate response for each of these actions. A gamer can choose to make unlikely decisions or to follow unlikely continuations of a conversation with a NPC. *Mass Effect 1* (2007) is an SF action game. It has a conversation wheel that allows choices in the conversation with NPCs. It is not really meant to introduce humor in the conversation, but dialogue choices, including ‘charm’ and ‘intimidate’ options allow the creation of verbal exchanges and decisions that can lead to intended bad endings, strange relationships and humorous situations. Creative play with a game’s engine has led to the Machinima genre of gameplay videos, compilations of physical humor [8].

5 Conclusions: Humor in Smart Environments

Game environments are driven by a game engine. We can expect that future smart and interactive environments will be controlled by environment engines. It will depend on the goals of the environments or sub-environments how much control a user has when actively or passively interacting with the environment. Digital technology as it is available in sensors and actuators in our environments and as wearables on or in our bodies can extend existing humor techniques or introduce new techniques just as the game mechanics in a videogame can challenge us with situations we cannot encounter in a non-digitally enhanced physical world.

We can have canned humor in smart environments, without or hardly having a relation with the aims of the user, but scripted humor can also appear in a more integrated way, similar to what we see in game environments. Conversational interaction with physical robots, virtual agents and tangibles can also be sources of humor. Earlier we mentioned possibly funny behavior of robot butlers. Goal-oriented behavior of a human inhabitant can be accompanied with humorous comments that depend on the progress that is made, in this way getting closer to situational humor.

Just as in games we will have hacking, cheating, and exploitation behavior in smart environments. In particular exploitation behavior, not using the environment in the way it is supposed to be used, but searching for actions and creating events that have not been anticipated by the designers and that are humorous or potentially humorous. This provides the exploiter also with knowledge about the environment that can be used to make others the butt of a practical digital joke. Accidental humor can also follow from straightforward bugs in the environment or from clumsy use because of unfamiliarity with new technology. And, as mentioned in [24], due to our digital multitasking behavior, we will often be confronted with juxtapositions of information chunks that can be unexpected and potentially humorous.

Having (partial) control of an environment provides a user with the possibility to make changes to the environment and have the environment (and its objects and devices) act in a humorous way, to this particular user or to his or her audience, sometimes requiring a human or digital ‘victim’. As mentioned in Sect. 2, we can consider a ‘weak’ and a ‘strong’ sense of humor, and a continuum from weak to strong with an increasing role of the environment and its objects and devices in creating humorous events. In this continuum we can make use of the typologies of humorous nonverbal behavior or humorous physical events that we mentioned in Sect. 3 and the humor emerging properties of game environments as discussed in Sect. 4.

Does every smart environment need a sense of humor? People use humor everywhere, even to cope with unbearable situations [25]. But clearly, when implementing a sense of humor in smart environments we can first look at rather ‘innocent’ domestic, public space and urban applications where our behavior is not always only goal-oriented, where we are more open to humor and where we can also engage in entertainment applications. In recent years we see, for example in research reported in the ACE (Advances in Computer Entertainment) or CHI (Computer-Human Interaction) conferences humorous aspects added to sitting in a bath, brushing your teeth, looking in a mirror, turn off an alarm clock, or let your microwave do its work by performing physical exercises. Playful and humorous interaction helps to persuade users to perform certain tasks. User-controlled smart sensors and actuators allow a user to manipulate the environment in order to create humorous events or humorous applications. Humor intelligence added to a smart environment allows the environment to recognize and introduce humorous events [26, 27].

However, it can be expected that in addition to government regulations that require monitoring our digital behavior, companies that provide us with domestic and safety applications, that take care of our energy, water and information needs and that provide us with smart environments will probably restrict our freedom to make changes to our smart environments. There is of course a chance that the sense of humor smart environments will have will be decided by others than its users [28].

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