From: [redacted] on behalf of Ben Goertzel <[redacted]>
Sent: Sunday, July 17, 2016 8:36 PM
To: jeffrey E.
Subject: Re: MUSIC and MIND ... Fwd: quick question -- AGI-16 snacks and reception sponsorship?

Looking forward to discussing AGI with you and a few others on the 21st ;-)

In the meantime, semi-relevantly, I thought some more about surprisingness, pattern, music, etc....

Musing about how musical psychology relates to the psychology of other human activities, I started musing about the role of unpredictable timing in sexual arousal ...

In the pre-orgasm phase, extremely regular and predictable movements are great, as long as they're the right movements

But in the earlier phase, where arousal is still being built up, random variations in timing are desirable. That is, a specific pleasurable motion every 5 seconds is worse than the same pleasurable motion delivered with a MEAN interval of 5 seconds but random variation of, say, 2 seconds variance on either side. My suspicion is that this is true if the movements are delivered by a purely automated tool, but even more true if the movements are delivered by an agent that has emotions or is perceived to have emotions.

What is this all about?

To understand this we have to understand that human pleasure has at least three aspects:

- Raw underlying pleasure
- Comparison of pleasure to immediately-past pleasure
- Comparison of pleasure to (e.g. cognitively) expected pleasure

So, considering the scenario above (building arousal via the tension induced from random timing variations in pleasure), when the pleasure comes a few seconds early, then one is getting MORE THAN EXPECTED, right? That's pretty exciting! One expected to get goodies after=5 seconds, but instead one got them after 3 – woo hoo! As our excitement is often proportional to the difference between what's expected and what's obtained, getting goodies at 3 seconds when one only expected them at 5 seconds is GOOD – assuming that one is time-discounting reward, so that rewards occurring sooner are, by some factor, better.

But what about when the pleasure comes a few seconds later? Well, by the time 7 seconds have rolled around, one is feeling pretty eager and disappointed and frustrated. After all, the pleasure was supposed to come at 5 seconds, right?! But wait a moment – that makes it all t=e more pleasurable when it comes along after 7 seconds! The pleasure is not just delivering pleasure, it's delivering relief from frustration. Because we derive excitement from the contrast of what we get with what we HAVE, as well as from the contrast of what we get with what we expected. And because the disappearance of pain (or even the shift between different kinds of pain) can bring its own kind of pleasure.

But if the goodies predictably came after 3 seconds, or after 7 seconds, then expectations would just get recalibrated – and the ne= "on time" would be 3 or 7 seconds instead of 5. If 3 seco=ds is what's expected, then 3 seconds isn't excitingly soon anymo=e – 1 second is excitingly soon ... and 7 seconds isn't a tantalizi=g delay anymore... it's a highly frustrating delay that starts making=one bored or angry or confused....

The delay from 5 to 7 seconds may be just enough to create a little frustration, which is rapidly vanquished in a poof of release when the pleasure finally comes. But a delay from 3 to 7 seconds might be soooo long that frustration builds up to the point where the pleasure doesn't release it when it finally comes – perhaps the dela= is long enough to trigger some cognitive process thinking "WTF is going on,=is the pleasure ever gonna come again?"

3 seconds or 5 seconds may be long enough for some anticipation to build and then get fulfilled. If the pleasure came after half a second the experience would basically be one of pleasure never stopping – which in a way would be more pleasurable, but in a way would be less pleasurable, because the process of building an expectation and then getting it fulfilled would not be there... and a= the cognitive rather than purely physiological level, pleasure is largely about expectations and their fulfillment and disappointment�=A6

Now, human sexual arousal is not one-dimensional, there's not just =ne "pleasure button" being pushed at various intervals. Rather= there are various different tissues which are stimulated by different things, and which get pleased, roused to anticipation, and become frustrated upon neglect – with different time-scales. So what one has in a re=l situation of human sexual arousal is the above story, but on a variety of different tissues, each with their own characteristic time-scales. There is a sort of symphony of anticipation, fulfillment and frustration, as at any given time some tissues may be satisfied, some may be anticipating, and some may be frustrated....

And then of course, in human sexual arousal, there is also an overlay of more complex emotions besides pleasure and its expectation and frustration. When the other party seems eager and keeps getting ahead of what seems to be the natural rhythm, that may make one feel loved or at least desired; a lackluster or overly robotic rhythm may make one feel that the other party isn't really into it; etc. The arousal of these emotions is more variable among different people, whereas the basic logic of arousal via expectation and frustration is more generic. A person's specific physiological and emotional makeup, layered on top of the basic biology of human physical pleasure and the math of expectation fulfillment and frustration, add up to form that person's personal sexual pleasure calculus...

The next ingredient to introduce into the story is PATTERNS. In a sexual context, stimulation is not just a matter of delivering pleasure to one or another tissue; pleasure may be delivered in specific patterns of touch geometry and intensity, and the body comes to expect these patterns. A "French corkscrew twist" move=ent of one sex organ within or around the other; or a stroke of the hand repeatedly up and down the lover's hip; etc. etc. Such a movement pattern will typically have a certain timing, and can be accelerated or delayed, inducing dynamics of expectation, fulfillment, frustration, tension, etc. Furthermore, movement patterns impact each other, as they may involve adjacent, overlapping or more subtly cross-connected parts of the body ... so that fulfillment of one may cause deferral of another, etc. Kissing on the neck faster and faster may cause what's happening with the genitals to temporarily get slo=er and softer, etc. – pleasure via acceleration in one place correlate= with pleasure via temporary frustration and then fulfillment in another place.

And this complexity brings us finally back to music. In music we have many complex patterns unfolding through time, each eliciting expectations regarding what will come next. The symmetries of musical scales and chords are instrumental in forming these expectations. When a chord pattern has been repeating, one expects it will continue. When a melodic line has been going up a certain scale, one expects it will continue. When a melodic line has been going up and down within a certain scale, one thinks it will stay within that scale. When two melodic patterns have occurred, each immediately followed by their inversions ... and then a third one occurs, one expects it will be immediately followed by its inversion. And so forth.

So what we have in music is a collection of interlocking patterns, each giving rise to expectations. Each of these expectations may happen a little sooner or a little later than expected, thus causing extra bursts of pleasure in accordance with the basic logic of anticipation, frustration and pleasure. Making one pattern continue sooner or more intensely, will generally cause some other pattern to continue later or less intensely — thus weaving a complex web of fulfillments and frustrations, which reminds us of the complex webs of fulfillment and expectation in our inner and outer lives.

A series of notes in time displaying an increasing amount of pattern, will often have the property of fulfilling an increasing number of the expectations elicited based on the previously occurring patterns. So on the whole it will give the feeling of increasing pleasure – increasing fulfillment of expectation. But of course it's hard fo= this to go on too long, because creating an increasing amount of pattern is difficult, assuming these patterns must have some emotionally evocative content in themselves, and that all the patterns are created via arranging the basic notes, chords and scales in the vocabulary of modern music.
So typically in a substantial piece of music, after a build-up in which the time-series of musical events generates a greater and greater density of patterns, things relax. Here the intellect is being less stimulated, but if the relaxation comes with continuation of a pattern that is emotionally resonant, then the experience is still satisfying. We see in this case the combination of the primal/visceral and the mathematical in music. The mathematics of pattern emergence and tension buildup are critical, but there is also a simple matter of resonance with the rhythm of human bodily life – there is something innately satisfying, to anyone with a human body, about quieting down and proceeding at a slow regular rhythm after a huge burst of increasingly complexly patterned activity.

On Mon, Jul 11, 2016 at 9:55 AM, Ben Goertzel <[redacted]> wrote:
> Formulating the norm is exactly what music theory is about, right?
> But the tricky thing is knowing which deviations from the norm are
> going to sound awesome and which are going to sound like screw-ups....
>
> You know Schmidhuber's theory of beauty as increase in compressibility?
>
> http://people.idsia.ch/~juergen/creativity.html
>
> http://people.idsia.ch/~juergen/sice2009.pdf
>
> It's not quite right but it's insightful ... a deviation from the norm
> that sounds awesome usually is one that causes some meaningful but
> not-wholly-expected pattern to come about ... i.e. an increase in
> compressibility ...
>
> Actually I think an **increase in the number of compressing patterns**
> is perhaps more important than an increase in compressibility.
>
> "Surprising fulfillment of expectations" means:
>
> -- the previous expectation is fulfilled, i.e the previous compressing
> pattern continues
>
> -- a new, surprising factor is found ... but probably one that also
> leads to a new pattern in the overall perceived music, hence a
> new/different compressing pattern

>
> So surprising fulfillment of expectations is one route to get to
> "increase in the number of compressing patterns" ...
>
> But music theory constrains the set of ways that one can get increase
> in the number of compressing patterns, without getting too complex
> (within the context of the 12-note scale... but if one used other
> scales one would find similar mathematical structures) ...
>
>
> ...
>
> About your other question: So far the recurrent neural nets,
> convolutional neural nets etc. that have been used for language
> generation based on corpus-based-training, tend to generate gibberish
> that looks OK in the short run but nonsensical in the medium run.
> I.e. plausible looking phrases but meaningless/fucked-up long
> sentences or paragraphs...
>
> A game like Go or Atari games is quite different from natural language
> because it's a closed system, so the scope of patterns that can occur
> is much more limited than in the case of anything involved with real
> human life... In the case of stuff that's real-human-life-related,
> it's hard to hide from the need to understand particulars in a general
> context ... but in a game the context is always the game, which
> simplifies things a lot (unless the game were as complicated as the
> real world, but that's never the case in 2016 ...)...
>
> I can explain to you my specific plan for solving the "sensible,
> context-appropriate language generation" problem in an OpenCog context
> sometime if you're curious...
>
> part 1 is here
>
> https://arxiv.org/abs/1401.3372
>
> and part 2 i□�

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