Multimodal Design Patterns for Inclusion & Accessibility

Transcript from the 2017 Accessibility Conference

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For more information, contact:

- Project Website: http://fluidproject.org/
- IDRC Website: http://idrc.ocadu.ca/

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SPEAKER:

We are going to get started. On your left inside, you will see live captioning happening. Here it goes. If you want to follow along on your own device, you can use the information on the screen.

You should be here for multimodal design patterns for inclusion and accessibility with Alan Harnum. He works at OCAD University. A former librarian, he works as part of an internationally

distributed research team to build inclusive software, explore design philosophy, and improve practice. This involves turning a pie chart into sound files. Please join me in welcoming Alan.

ALAN HARNUM:

I was wandering around a few minutes ago looking for the actual room that they would have me in because I wasn't aware that I was going to be in the large one, but that is OK. You are all friendly people and I am a friendly person and we should get along.

Randy has a introduction. I have a slide for myself that I will skip over, but it is important to know where people are coming from institutionally and personally, so I will spend a few minutes on that.

First of all, I work at the inclusive design research centre at OCAD University, which many of you are probably familiar with. We do design research, both in web accessibility on a broader area of inclusive design, so that includes things like economic exclusion, things that are perhaps get thought of as disability, and we are a highly integrated research unit, but something is that our work is rooted in are social model solve disability, which the previous speaker was talking about.

We're off the line of thinking that has become predominant in the last couple of years, just around how to think about disability and people with disabilities. It is not adhered to by a medical model of someone being a disabled person, but it is created within the Nexus of society. If you keep that in mind, that is an important parameter.

We also have into the open resource movement, things many of you will be familiar with.

A lot of our research also falls into practice based and practice led research, but practice-based research is around the creation of artefacts to demonstrate the research process which we do a lot of, and you will see that as we go on. Practice led researcher’s research that aims to inform and advance the practice itself. The practice we do is inclusive design, continually learning new things and reflecting on those things, feeding them back into the processes.

So, the fluid project which I will talk about, that is an open source community that we participate in with a b influence on web accessibility and inclusive design. Many of the things we do fall under this general umbrella of the fluid project.

There is a long history of this name, but if you are interested, you can ask someone who has worked with the project.

Randy already introduced me, but I am a software developer by profession, so one thing I will try to avoid through this talk is talking about too much software language, but I will try to catch myself on it and rephrase it into broader terms than that. As Randy mentioned, I am a former librarian, so I have had a certain perspective on that from the 10 years that I spent working in public libraries on how services get provided.

The one other thing that I was curious about, and in the larger room this may be hard, I am curious about where people are coming from themselves, so if you want to indicate with a raised hand or other indicator of choice… Who here would be under software developers? Some hands for that.

Designers? Hands for that. Obviously, you can be more than one.

Managers, you manager team?

Assessors or testers?

Consultants? A few of those.

Something I didn't categorise?

Right, that is around the mix was expecting.

So, what is multimodal design? Thank you for coming for the session after the keynote session, and I know everyone is probably digesting lunch, and the best thing to do is hear a somewhat theoretical talk on something that the presenter is not entirely sure he understands.

Multimodal design is a design that is explicitly intended to accommodate different patterns of input and output, and I wrote this and send it off and it got published, and then I thought about it and people said it was a very computer science way of putting it. "Isn't there a better way of talking about this?"

Here is my more expanded definition, a modality in which something exists or is expressed. This can go through sensory or cognitive definitions, so it is not just things that are interacted with. When we talk about multimodal designs, and this is something that we talk about more and more, we are talking about designing and building things and that is a very broad term that means digital, the built environment, anything that people are intended to experience or interact with in the world that explicitly aims towards accessibility, discreetly or explicitly.

If I say input or output, things that can be substituted into that at times like interaction and perception, or in the web guidelines, operability and perceived ability. I am talking about how

we deal with things in the world. I said this would be a loosey goosey kind of talk, but that is the best I can put it.

The philosophy of this approach to designing and building and thinking about iterations of things that we work with is to design to accommodate these different patterns of input and output, perceived ability, interaction, and also, to make those interactions more flexible to support future adaptability.

I come out of a systems background, but also, I come at this from the perspective of someone who has worked as part of a large institution, who has worked a lot with institutional policy. When we adopt something, a policy, a product, a system we are building, a design, we don't necessarily know the future of the present, or maybe even the past. We have to have any limitations that we do be flexible to support this future adaptabilities.

We can't think about normal and alternative when building systems and designs. We need to take into consideration, and this is where multimodal thinking comes in... How do we think about this separately to increase the space in which things can be interacted with or perceived, and how do we find ways to let designs stretch as we find more modes of interaction?

At this point, you might be thinking that this sounds highly theoretical. Practically speaking, what I would say is that this is (inaudible). As practitioners, you already have an orientation towards this approach, even if it is coming under these different terms.

If you think about web accessibility, things like screen-based displays versus screen readers, mouse input, keyboard input, import such as switches, toggle switches, there is already… You have already done a lot of the work that is required. It is always an ongoing process. There is a feeling that everybody experiences things and works with things and interacts with things in the same way that you do, and this is a very hard thing to escape.

There was a lot of natural self-centredness around products, but things like… I have fairly significant (inaudible), so this is one of my touch points. I don't experience things in the same way that many other people do. Nobody does, really. We talk about social construction, we talk about one-to-one customisation and that everyone has unique needs at a particular time.

I would say that we already do a lot of multimodal work to begin with.

One thing that is cool, because we are a research institute, we do a whole bunch of things, but we get to do other things that are bit out there. I was reading an article about Xerox part, when you get to play baseball in front of golf. You get to make got a big swings and potentially have a

number of misses with the hopes of hitting homeruns, so a lot of this is quite new, but we will see.

For those less explorative things, things to think about… Can we turn compact data into sound, sonification, in the same way that we visualise data as charts and graphs? How do we expand the space in which peoples input devices can become first-class citizens of a digital world? How can we create systems that are open to new modalities?

I don't have all the answers to these questions. I have a few thoughts in that direction.

So, examples from the work we have been doing in the last couple of years. What is a pie chart sound like? Any guesses of what a pie chart might sound like?

I will play you what our default version sounds like. I will play at once and explain what is going on. You can see how it sounds. Let's do a sound test first. This is hopefully not too loud.

(Video plays)

What we have going on is a fairly simple encoding scheme of one tone for a 10% measure and a number of short attains for the remainder of that. I will play it again. I have implemented this and heard this roughly 50,000 times at this point.

(Video plays)

What we have here is an explicitly multimodal chart interface that takes a set of data, spits out a pie chart for it but also, at the same time, converts the data into something that could be heard, and the immediate context that comes to mind is something like visual impairments, but there are all kinds of other applications for hearing data that don't fall into this. If you are not able to focus on something visually, if you are driving for example.

So, we are exploring this to think about how we take data that you might traditionally visualise or render in a table and turn it into other modalities. We're talking about moving towards a bunch of different ways of allowing the conversion of data in the sound, but also, giving people the ability to do their own customisations.

We have also been looking a little at things like touch-based feedback for data. If you grab onto something like controllers or pulses... You can get a pulse of what the data is like with the PlayStation 4 controller. That is one example.

Johnny, it's you.

(Video plays)

(inaudible), and you can also see that there is a conventional piano in the background. It is hard to see from this angle, but there is a phone being used to control this as well, so if you keep that in mind...

(Video plays)

(inaudible) to build technologies easier. Nexus is written in different technologies, and that is run on different devices. We can connect stuff without (inaudible)

So, we have different devices here with different interfaces. This computer here is where the sound is coming out of, and this is the computer that is running the Nexus itself. This is connected wirelessly talking about the Nexus.

This is what I have been talking about. I have been talking about highly customised routing of arbitrary inputs and outputs through a central transformation. We're working on the technology that takes consumer devices into things like phone accelerators, game controllers and use those two feed new forms of accessible technology. We are primarily looking at inputs. We are looking at inputs/interactions, as well as outputs and experiences.

(inaudible) for science experiments around making more inclusive experiments in the environment. This is the part I have found most interesting.

(Music plays)

That projects involves the same technology as you saw in the previous video. This is called the Nexus. It is named after Star Trek.

If you use a pH script before… You can use these little sensors that you can run through a USB. We stream a feed into the Nexus and we can then put it out into different formats. We have done some really interesting things with braille sensors, and I will have the links to all of these videos later.

Other things. The last example before I get into talking about a few other things, and then we will have time the questions, is that we have been working with the University of Colorado. They do interesting projects, and they just put out their ultimate modality for one of those simulations. One of them is John Travoltage, which is all about using 1970s movies to learn about electricity.

You can kind of see… What we ended up doing, we spent a fair amount of time talking about how you end up representing this different mentality which can be highly visual in a screen

friendly form, and it ended up like a text adventure. (inaudible), and in the process, we have ended up with the team building more and more possibilities for additional frameworks.

So, from those examples, I am going to talk a little bit about what I have called tools and patterns for implementation, so if any of this strikes you as interesting, what kind of things are out there, what kind of thinking do you need to have for this.

This separation of concerns, that if you do software development, you will be aware of this as a time, that it is a really foundational system. In web development, we find this in the different roles of HTML, CSS and Javascript. We find it in things like the accessibility APIs that mediate between diverse ranges of applications and various forms of AT.

So, this… In some ways, it is a bit 101, but as you encounter systems in the real world, particularly doing accessibility and if you work for a large enterprise, one thing you will find is highly monolithic systems that are hard to break apart. This is really challenging to both provide forms of accessible things in the future.

We need to strive for open systems oriented the transformation. That doesn't necessarily mean open source, though we are big fans of that. As a general principle, content and data should be easily external and transformed. Code should be as well. You should have the ability to extract, transform, externalise data, and similarly, entangled monolithic systems are tough on accessibility.

One of the general positive trends that I am excited about in terms of this and moving towards more easily multimodal systems and more accessible systems is the increasing predominance and awareness of application in areas like content management systems. Not because it is the end goal, but because this is the progress and direction that is becoming less and less acceptable for it to have a single, giant system that data and content is locked into.

So, that is a really positive trend in being able to implement things that I am talking about here.

Things that we work with on the fluid project, and I have a longer set of resources at the end, but I want to talk about three. First, we use and support a JavaScript framework called infusion, and in this context, I call it the transformation-oriented loosely-coupled JavaScript framework. If you work with things like Angular or React, many of the things about Infusion will be familiar.

You might have an approach that relays and transforms data into other forms. The Nexus, which I have talked about previously, and it was in the videos that I showed, this is a pretty new project for us that we are doing as part of the global infrastructure project. This is a general-

purpose technology for transforming inputs and outputs, connecting things together, as well as building technology. It is about building new experiences and modalities.

The last thing is the inclusive design guide, living documentation of our design as it evolves and deepens.

How am I doing for time? 15 minutes. Great. 14. It is counting down! There will be time for questions or tumbleweed like silence.

So, some thoughts. I am basically… This is more or less why you should think about multimodal design and care about these things. First of all, our thinking matters. That is chronological, but everybody is aware of this. How we conceptualise the work we do in accessibility, that matters a great deal. I would encourage everyone to think about the work that they do in terms of optimal design, trying to achieve that constantly, thinking about the differences and this is the direction to take yourselves in.

That insistence that no mood of sensory experience is normal. Language also matters, and I think this is the real critical theory part.

I think there are ways in which the language of accommodation and alternative presentation places a certain perspective on disability, which is often but not always heavily associated with a medical perspective and the idea of someone having immutable characteristics around them that makes them disabled.

There are importance constructs around legislation, and we can't ignore those. As with our thinking, I would really encourage you to think about the language that gets used through a critical lens, thinking about how it would circumscribe the work.

We sense you are frustrated with the remedial nature of accessibility work, and we talk about why these things don't work. I have a conference called please come and ask us first, where people can just sit around together and commiserate why nobody asked them early enough to make things easy enough to deal with.

This remedial approach happens because so many of the design and development practices that we are familiar with, that really gives primacy to the modalities of the normal user who can use as Cliff at the standard resolution. And following from that, the inflexible implementations include these premises, and it becomes around alternatives, accommodations, remedies and workarounds, and keeping in mind, I am thinking about an ideal world that we don't always get to experience, I would encourage you to think very widely about how designs and systems

might be experienced from the beginning. We want to hand crew these things, changing them for the users and their unique contexts.

And with that, I will throw the floor open to any questions.

SPEAKER:

We have got one already. Question one.

Would it be possible to incorporate musical notation of graphs into a screen reader?

ALAN HARNUM:

Yes. I have a very software developer answer to any question that begins with, "would it be possible…" "Everything is possible." If I am understanding what you are asking, getting it into a screen reader, you mean getting it into having it in encoding which could be interpreted in screen readers, so instead of hearing the old text and this is a craft that looks like this, you would hear this sonic version of this.

SPEAKER:

Yes (inaudible)

ALAN HARNUM:

Hm! I like that. I can think of a number of different ways to achieve that. You could look at the techniques that you might… There are techniques that can be used to make things invisible to a screen but perceivable. I think it would be certainly possible.

SPEAKER:

(inaudible), and that is coded. It is there through visual reasons, and the screen reader (inaudible)

ALAN HARNUM:

Mm-hm. Yes. Some of what we are… We are still working on figuring out these things, and at Georgia Tech, there is a sonification like that works on trying to figure out the best ways to do this, looking at what is effective and what isn't. It is really interesting and a new field.

One thing we talk about is that we have several hundred years of history about the visualisation of data. It has taken quite some time to make an understanding of what makes an effective (inaudible) to become agreed-upon, and even then, if you see the PowerPoint presentation,

you will have seen some graphics. Sonification is about 20 years old. It is all over the place in terms of what works, what doesn't work, and a lot of what we have right now is data.

There is a really cool open textbook that was funded by the European Union called the Sonification Handbook. You can read that online for free, I think. I have not read all of it, but I have read large portions of it. It is super cool, and I love the idea of being able to access it so easily.

SPEAKER:

Any other questions?

From the perspective of a web developer, if I want to make my content compatible with sonification, is that something I can do now? Would a web developer provided a table and it will be up to us to make a sound? With this start out as something that we would have on our own websites to create the sound ourselves?

ALAN HARNUM:

I think we are hoping, in the next couple of years… If you are interested in looking at what we have now, we can look at open source. That said, these are early stage resources.

In the next few years, we want to bring out more and more mature tool sets way you can drop something onto your page.

I would say that the thing that you can do to prepare… We have been talking about designs and flexibility, and you can have that data available somewhere in a structured form. A table has one form of structure, but it is not easy to extract. This is where talking about why I get excited around things like content management systems. Having things in the structured format is like one step towards enabling the other modalities, so I don't know if that answer the question, but if you have… Having things be structured and easily externalisable is step one, and that would prepare any development that you were doing to working different modalities as they become available.

SPEAKER:

It may also hasten the arrival of SkyNet.

ALAN HARNUM:

Yes, that is possible.

SPEAKER:

Great presentation. Are you using web browsers' audio engines?

ALAN HARNUM:

Yes. We are using the web. Everything we do in the browser context… It is 100% native web libraries, so web audio, web speech. In the case of this, the tones that you heard, we use a library could flocking which is an open source project developed by one of the staff members.

It is in the infusion that we mentioned, but it is all web audio.

SPEAKER:

So, you are using a lot of maths to create that?

ALAN HARNUM:

Yes. I stopped taking maths as soon as possible and went on to do an undergraduate English degree, so I am one of those humanities people who are bit like, "argh, math!" I have learned more map then had to use more maths on this project and I think almost anything I've had to do before.

SPEAKER:

When will the library be ready to use?

ALAN HARNUM:

I don't know. It is usable in a sense if you want to go and have a look at the code, it is there. It has comments and documents…

SPEAKER:

(inaudible)

ALAN HARNUM:

Yes. Our repo is fluid-project, so if you are curious, you can have a look at it right there.

SPEAKER:

We have time for one more question.

How have end users responded to this design?

ALAN HARNUM:

Do you have any of the designs in particular that have examples, or in general to the ideas?

SPEAKER:

Sorry, the sound one. I am an individual who is blind but I am just wondering… I am sure that user testing was done, but how did people respond to it? You are talking about operability and perceived ability, and I was thinking about how, for me, it was a hard thing to get my head around, but I can see it being useful. I have seen it in macs, for example. I had never thought about it in this pie chart form. I was wondering about the back.

ALAN HARNUM:

We did some work in late 2015 with a mix of seeing and blind users. I would characterise the feedback is positive but occasionally confused. I think a lot of people thought it would be useful, but the phrase we heard again and again was that I think it would be useful but I need some time to get used to it.

I think the pie chart is a very simple example. Some of what we are interested in is translating the advantages of visualisation of information around expressiveness, and the way you can look at a chart and how you interpret the chart. Can we get that into a form where you can have a complicated graph data? You can hear a 15-second snippet, even if you don't have… You can get a sense (inaudible)

SPEAKER:

That is all the time we have. Please join me in thanking Alan Harnum.

(Applause)

ALAN HARNUM:

Thank you very much.