Sound Objects: Towards Procedural Audio for and as Theatre

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"Two practical artefacts - **RayGun** and **INTERIOR** - that explore the possibilities of procedural audio in (and eventually as) theatre."

MD:

- Music technology - particularly musical interface/DMI design.
- Previous project ("Bert") explored recorded soundtracks as non-othering and less literal alternative to AD for blind/VI theatre audiences.

SW:

- Musical theatre, theatre - particular focus on uncovering the work of underrepresented and minoritised groups in theatre history.

Sound in Theatre

Developments in sound old as theatre itself, e.g.:

- Exploitation of architectural acoustics in Ancient Greek and Roman amphitheatres (Rindel, 2011).
- Ancient Greek theatre masks modified voice as well as appearance (Vovolis et al., 2013).

Increasing sophistication, e.g. mechanical thunder run at 1599 Globe theatre opening (Bennett, 2019, p. 93), but role of sound also evolves - more freedom (Culver, 1981).

Sound in Theatre

….but sound has generally remained of secondary importance:

- "the nucleus of theatre is usually the dramatic text, the actor's body or the visual spectacle." (Sahai, 2009)
- "sound, unlike lighting, was not generally considered to be a base-level technical requirement of theatre other than in musicals." (Brown, 2009)
- [contemporary] theatre sound and its practitioners remain poorly understood (MacDonald, 2016).

Sounds in Theatre

- Limited discourse around sound in theatre, relative to sound for film and video games, e.g.:
    - Rick Altman (Ed.) (1992)
    - Michel Chion (1994; 1999)
    - Karen Collins (2008)
    - Mark Grimshaw (Ed.) (2010)
    - etc.

Types of Theatre Sounds

The basic sound categories suggested by Collins (2008, p.5) and Liljedahl (2010) are quite compatible with the theatre context:

- ○ dialogue
- ○ sound effects*
- ○ ambience
- ○ music

* but prop sounds have some unique challenges - the need for responsiveness and localisation.

Procedural Generation

- "Content or structures created by a formal process" [....] "algorithmic creation" (Smith, 2015)
- Often assumed to be computerised and contrasted with manual creation. (Hendrikx et al., 2013)
- Renewed interest over last decade:
  - Large-scale, on-the-fly world generation. (Freiknecht and Effelsberg, 2017)
  - Reducing laborious and repetitive content tasks. (Hell et al., 2017)

Procedural Audio

"non-linear, often synthetic sound, created in real-time according to a set of programmatic rules and live input." (Farnell, 2007)

"sound qua product" [recorded audio] vs "sound qua process" [procedural audio] (Farnell, 2007)

Procedural Audio

Applications include:

- Video games: *Spore* (2008), *GTA V* (Rockstar, 2013), *No Man's Sky* (2016).
- Commercially-released music (Collins and Brown, 2009).
- Sound design for animation (Farnell, 2007).
- Sound design for electric vehicles (Fitzgerald, 2015).

...but only limited crossover into sound for theatre so far, e.g. synthesis in Gareth Fry (2019).

Procedural Audio

"Compared to pre-recorded sounds, it [procedural audio] allows interactive manipulations that would be difficult (if not impossible) otherwise. In particular, procedural audio parameters can be linked to motion parameters of graphics objects to enhance the sound/graphics interactions."
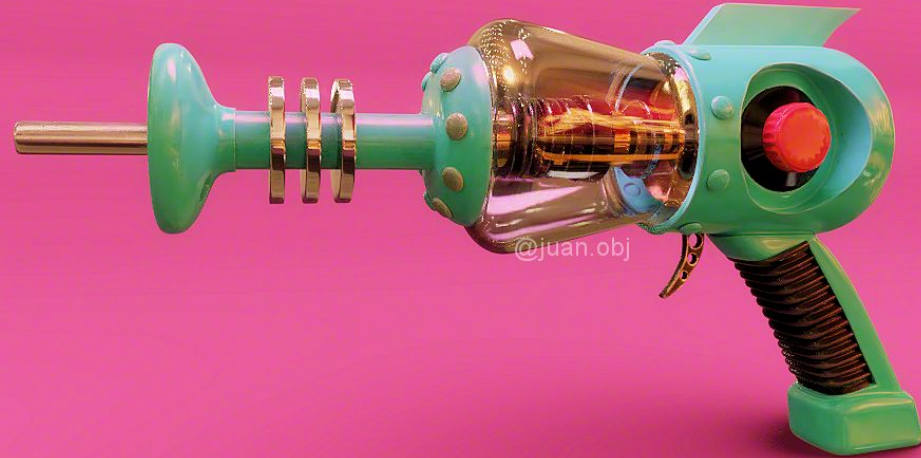
(Verron and Drettakis, 2012)

RayGun
(prop prototype)

Background

- Ray-gun, death ray, heat ray (etc.) - long history in Sci-Fi.
- Fictionality affords design freedom.
- Simple and abstract, but immediately recognisable sound.

RayGun Prop Prototype

Twin focus:

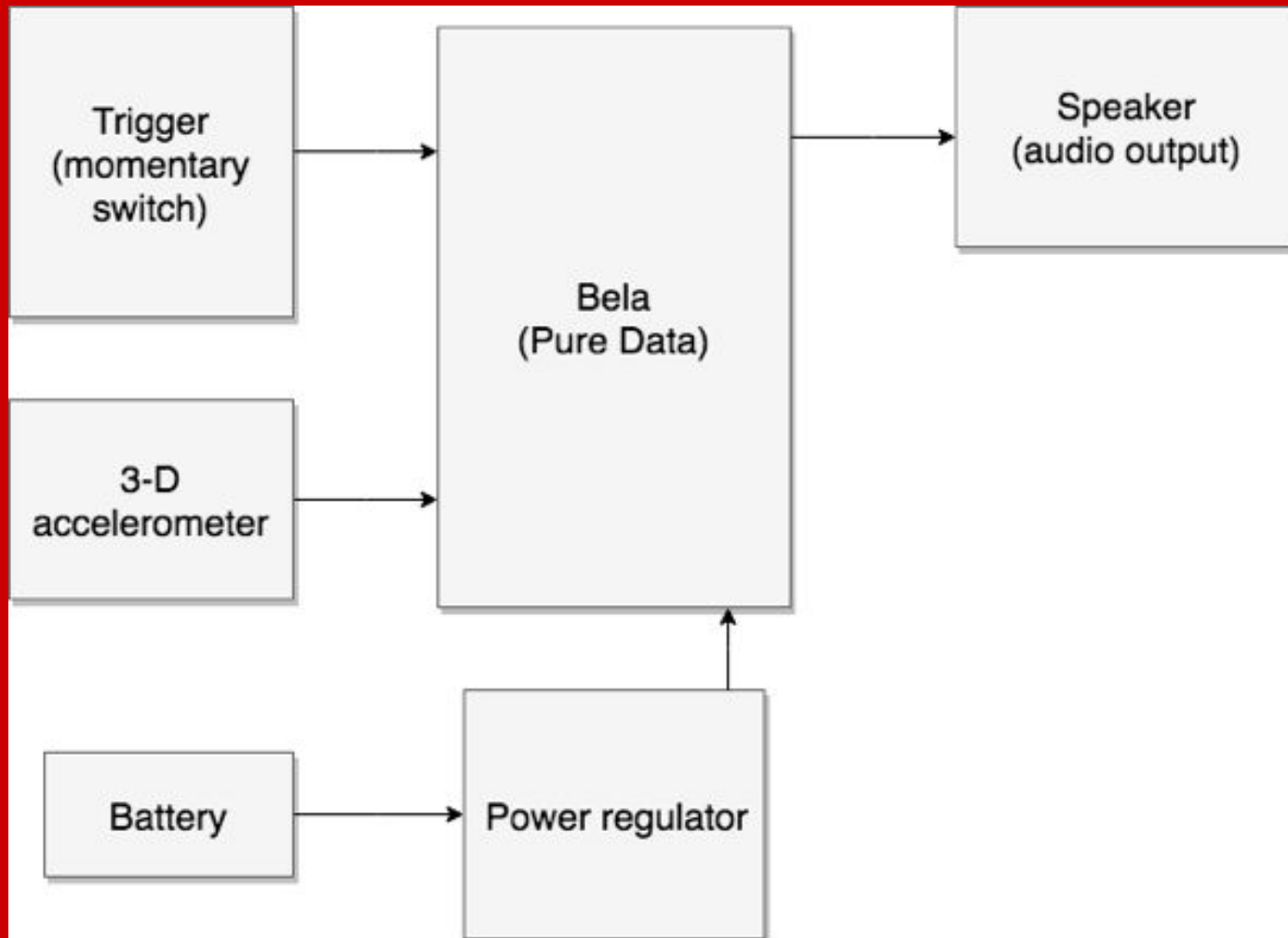- Highly localised sound output
- Responsive to user gesture
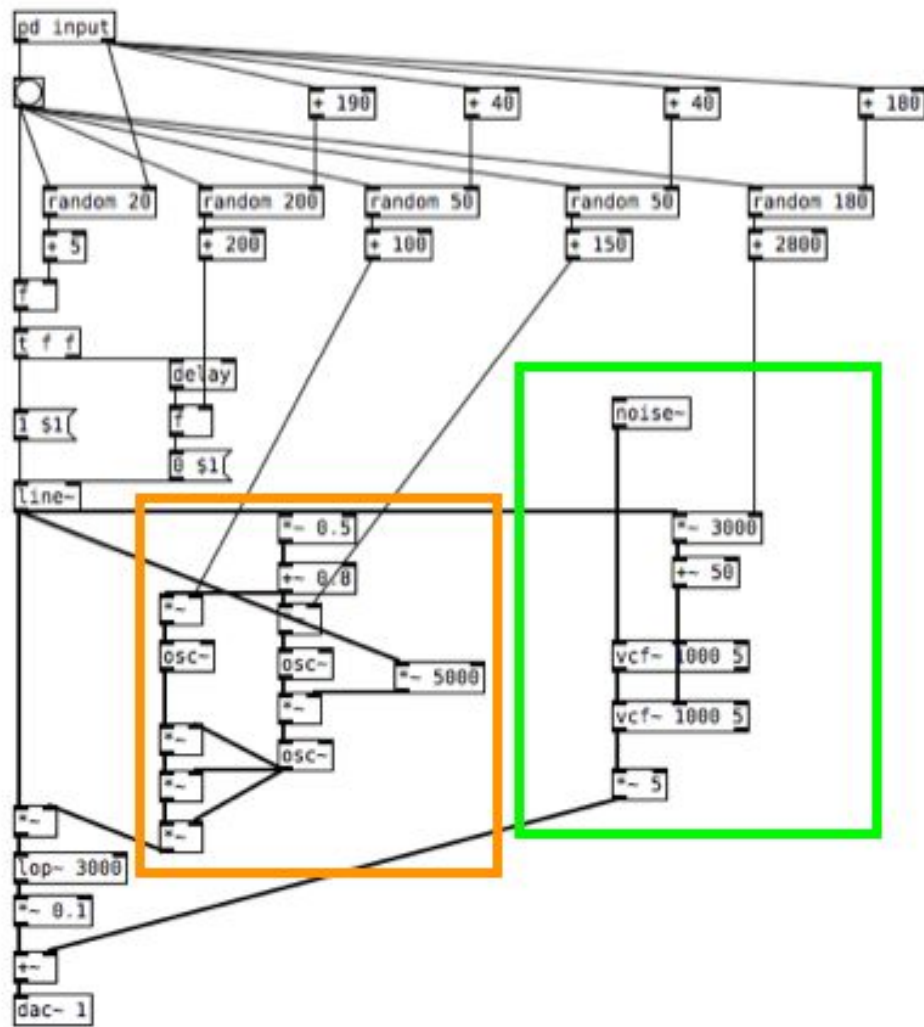
(sketching in hardware)

RayGun system:

Sensors --> Bela (Pd) --> 3" loudspeaker

RayGun system diagram

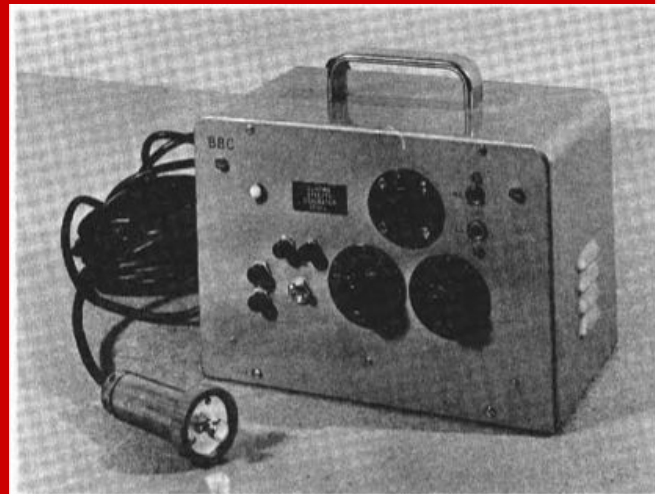# RayGun Pd patch

RayGun prototype

Related Work

Lots of synthetic gunshot sound effects:

- Brooker (1963, pp. 15-17)
- Farnell (u.d.)

...but not focussed on embedding sound generation and diffusion/projection into the prop.

Fig. 12 — Photograph of electronic gunfire effects generator.

Related Work

Also augmented props, e.g.:

- Zhang et al. (2017) "Magic Props"
- Fenyce (2017) "The Oracles"
- Kwon *et al.* (2008) tangible/virtual props

…but not focussed on PA or even on sound.

Related Work

PLOrk's hemispherical loudspeaker addresses the sound localisation issue - but in a context of a live computer music ensemble (Smallwood et al., 2009)

INTERIOR
(audio play
artefact)

INTERIOR

Recasts Maeterlinck's *Interior* (1895) as a generative -- and largely procedurally-generated -- audio play, embedded in a self-contained and portable, radio-like artefact.

Interior (1895) - the play

- Intended for marionettes.
- Two characters outside a house, debate whether to tell the family inside terrible news
- Almost nothing happens (the uneasy wait).
- They're eventually forced to enter, but we never hear what any dialogue from inside.

Interior (1895) - the play

[marionettes are able to be] "inhabitants of two worlds, the real and the unreal, they could be transformed into anything at any time: god or man, saint or sinner." (Knapp, 1975, p. 76)
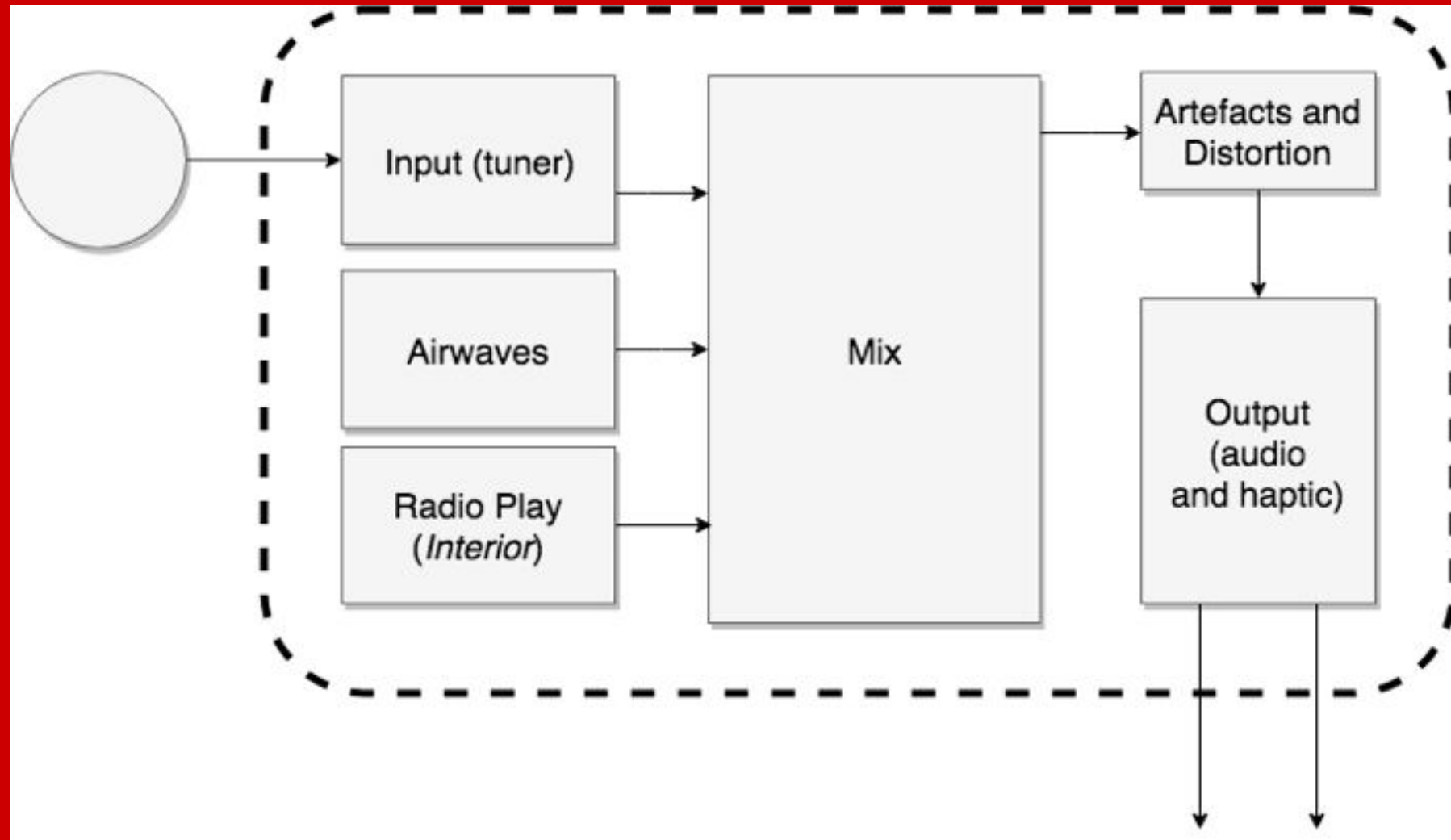
[the] "dissociation of speech and action breaks to a certain extent the conventional empathy usually existing between actor and audience."

(Knapp, 1975, p. 82)

INTERIOR - Design

- Portable and self-contained.
- Bi-modal (audio and haptic).
- Radio-inspired, single knob interface.
- The user 'tunes' through a noisy soundscape of pseudo-radio stations to 'find' the audio play.
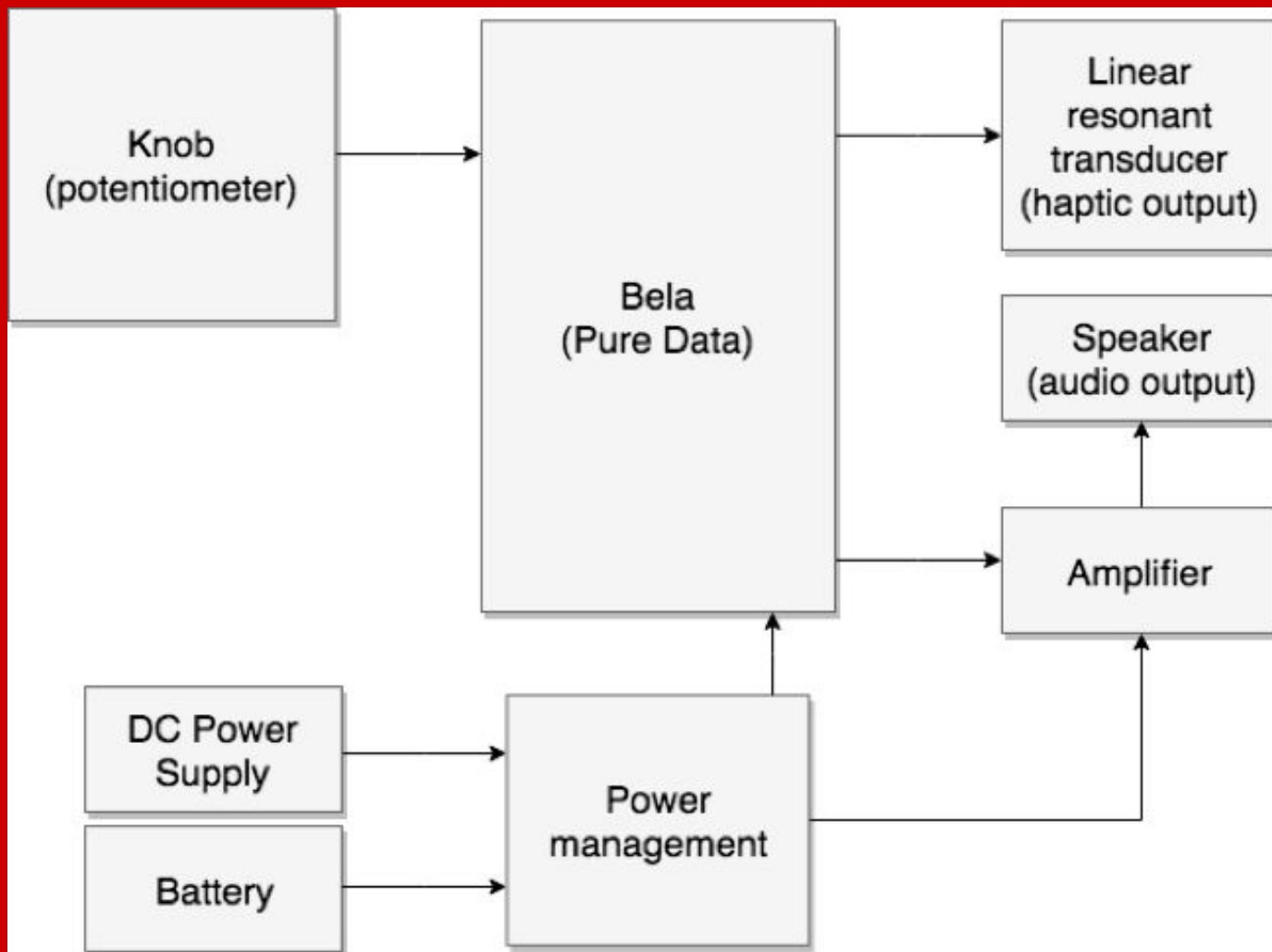
Radio Play layer (Interior)

- Concatenative speech synthesis for dialogue.
- Further processing (pitch-shifting, comb filter network, granular methods) and real-time synthesis to produce ambience and musical underscore.
- Real-time synthesis to produce sound effects - footsteps (individual and group), fire (Farnell, 2010,), etc.

Discussion

RayGun - relatively simple (sonically and in construction), but:

- A useful introduction to the Bela platform (for us).
- The start of a possible solution to some of the main issues around prop sounds (localisation and responsiveness).
- Immediacy seemingly engages actors and directors (etc.) who "wouldn't usually think about technology".

Discussion

INTERIOR:

- Pushed at the limits more; and so revealed more limitations.
- Intuitiveness of the radio-like interface - just down to simplicity or an interaction scheme that's outlived its underlying technology? (lives on in DAB sets, apps, etc.)
- Informal/small-scale testing so far, but 2/4 users have spent more time discovering/playing with the 'radio stations' than the audio play.

Discussion

INTERIOR:

- Dialogue particularly difficult using 'pure' procedural techniques - hybrid techniques still have some advantages.
- PG particularly well-suited to moving/evolving sounds (rather than static detail).
- …but fluidity/ability of PG-sounds to move seamlessly between different sound types problematises the rigid categories proposed by Chion (1994), Collins (2008), etc.

More at:

https://github.com/matdwlv/soundobjects

Future Work

- RayGun donated to 14/48 speed theatre festival (June 2020) to gain detailed user feedback.
- Next iteration of INTERIOR features simple visual feedback/display.
- Will be tested with 20 VI users 'in the wild' early next year.

Future Work

- Soft-haptics:
  - Individualised physical interaction properties.
  - Use changing/changeable physical form as integral part of storytelling.

- INTERIOR as platform - hosting more than one audio play/works by others within a common platform.

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