H.761 Support of a new SigGen Media Type to Enable Inaudible Sound Data Communication

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ABSTRACT

Current consumer devices, such as TVs, smartphones, smartwatches,etc., often come with built-in support for radio-frequency (RF) wireless communication. This support requires RF hardware and de-ends on technologies such as Bluetooth, IEEE 802 WiFi, or 4Gmobile networks. There are situations, however, where the RF data network is not available, or where it is more advantageous to use some other form of wireless communication. One alternative communication through inaudible sound. The same consumer devices that come with RF support usually come equipped with speakers and microphones which enables them to produce and detect inaudible sound. By inaudible sound, we mean sound waves in frequencies that cannot be heard by humans—usually those above 19–22 kHz. Many works in the literature that show that communication through inaudible sound is feasible on consumer-grade PCs, laptops, and smartphones. Here we are mainly concerned with the applicability of this technique to enable inaudible sound applications in the Ginga-NCL engines. This way, we propose a new type of media object called SigGen.

KEYWORDS

NCL, Ginga, inaudible sound

1 BACKGROUND

Current consumer devices, such as TVs, smartphones, smartwatches,etc., often come with built-in support for radio-frequency (RF) wireless communication. This support requires RF hardware and de-ends on technologies such as Bluetooth, IEEE 802 WiFi, or 4G mobile networks. There are situations, however, where the RF data network is not available, or where it is more advantageous to use some other form of wireless communication. One alternative communication through inaudible sound. The same consumer devices that come with RF support usually come equipped with speakers and microphones which enables them to produce and detect inaudible sound. By inaudible sound, we mean sound waves in frequencies that cannot be heard by humans—usually those above 19–22 kHz. Many works in the literature that show that communication through inaudible sound is feasible on consumer-grade PCs, laptops, and smartphones. Here we are mainly concerned with the applicability of this technique to enable inaudible sound applications in the Ginga-NCL engines. This way, we propose a new type of media object called SigGen.

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2 PROPOSAL

We propose a new media player, called SigGen Player. In NCL, this player is used through a new type of<media> element with a mime type "application/x-ginga-siggen". Its main properties are: freq (in Hz) to define a specific frequency to generate the signal volume (in dB) to define the volume of the used frequency spectrogram (false or true) to show spectrogram of the generated signal

Instances of the SigGen `<media>` can be controlled also be controlled by NCLua scripts. Such scripts can create elaborated transmission algorithms with different used frequencies and time intervals. This proposal is based on the paper of Nunes *at. al.* "Towards Data Transmission Through Inaudible Sound in Ginga-NCL"[1].

3 USE CASE

The following code illustrates the usage of the proposal. It sends audio data using ten different audio frequencies.

```
<ncl>
 <head></head>
 <body>
   <port id="start" component="m"/>
   <port id="start2" component="m2" />
   <port id="start3" component="m3" />
   <port id="start4" component="m4" />
   <port id="start5" component="m5"/>
   <port id="start6" component="m6"/>
   <port id="start7" component="m7"/>
   <port id="start8" component="m8"/>
   <port id="start9" component="m9"/>
   <port id="start10" component="m10"/>
   <media id="m" type="application/x-ginga-siggen">
     <property name="freq" value="20000"/>
     <property name="volume" value="0.8"/>
   </media>
   <media id="m2" type="application/x-ginga-siggen">
     <property name="freq" value="20150"/>
     <property name="volume" value="0.8"/>
   </media>
   <media id="m3" type="application/x-ginga-siggen">
     <property name="freq" value="20300"/>
     <property name="volume" value="0.8"/>
   </media>
   <media id="m4" type="application/x-ginga-siggen">
     <property name="freq" value="20450"/>
     <property name="volume" value="0.8"/>
   </media>
   <media id="m5" type="application/x-ginga-siggen">
     <property name="freq" value="20600"/>
     <property name="volume" value="0.8"/>
   </media>
   <media id="m6" type="application/x-ginga-siggen">
     <property name="freq" value="20750"/>
     <property name="volume" value="0.8"/>
   </media>
   <media id="m7" type="application/x-ginga-siggen">
     <property name="freq" value="20900"/>
```

```
    <property name="volume" value="0.8"/>
   </media>
   <media id="m8" type="application/x-ginga-siggen">
    <property name="freq" value="21050"/>
    <property name="volume" value="0.8"/>
   </media>
   <media id="m9" type="application/x-ginga-siggen">
    <property name="freq" value="21200"/>
    <property name="volume" value="0.8"/>
   </media>
   <media id="m10" type="application/x-ginga-siggen">
    <property name="freq" value="21350"/>
    <property name="volume" value="0.8"/>
   </media>
  </body>
</ncl>
```

Listing 1: NCL code fragment using the proposed approach.

REFERENCES

[1] João Victor G. de S. Nunes, Álan L. V. Guedes, Guilherme F. Lima, and Sérgio Colcher. [n. d.]. Towards Data Transmission Through Inaudible Sound in Ginga-NCL. ([n. d.]), 4.