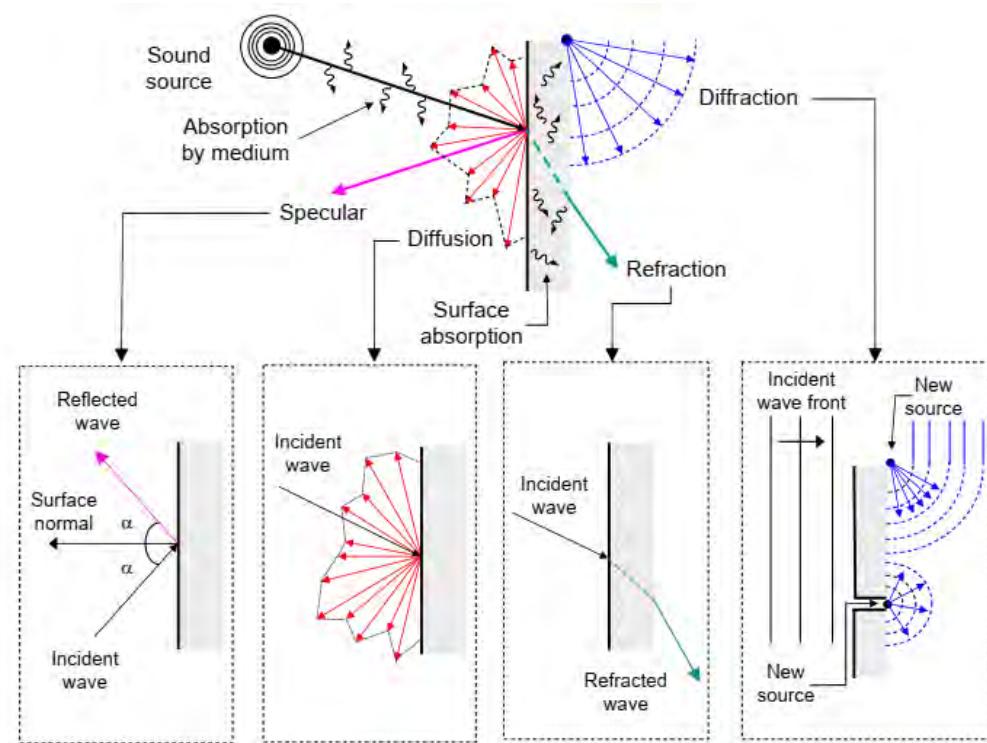Notes:

1. Check current version of Web Audio API for changes in attributes and nodes **DONE**
2. Re-draw a figure for "Acoustic reflection phenomena" **DONE**

Kapralos, B., Jenkin, M.R., & Milios, E.E. (2004). Sonel mapping: acoustic modeling utilizing an acoustic version of photon mapping. Proceedings. Second International Conference on Creating, Connecting and Collaborating through Computing, 1-6.
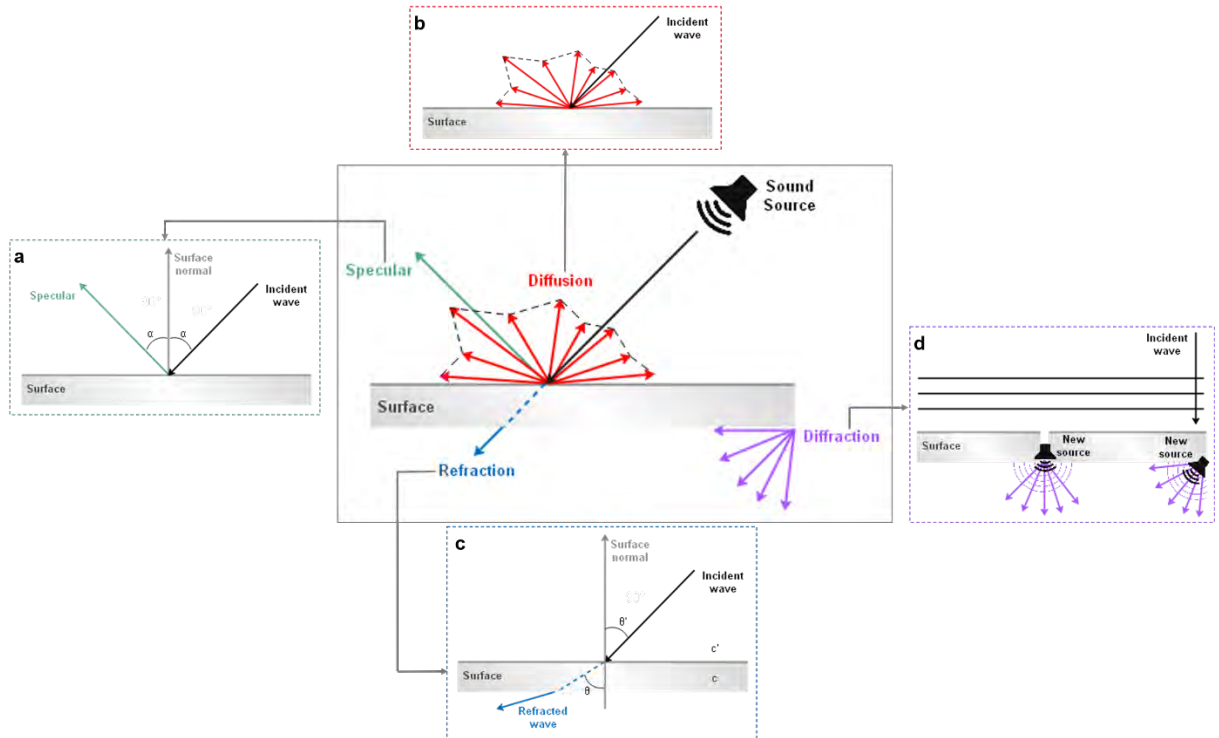
Re-Draw

3. X3D spec:
   a. a new section "16.2.3 Sound propagation" (add simple sound equations) **DONE** (see attached sound.html)
   b. check the definition of "refraction" field in AcousticProperties node. **DONE** (see attached shape.html)

email gaps:

1. Not finding description but am finding interfaces for
>
>   X3DAudioListenerNode
>   X3DSoundAnalysisNode
>   X3DSoundChannelNode
>   X3DSoundDestinationNode
>   X3DSoundProcessingNode

Actually, these nodes are the abstract nodes: (**open issue: their fields**)
X3DAudioListenerNode is the abstract node of ListenerPoint node
X3DSoundAnalysisNode is the abstract node of Analyser node
X3DSoundChannelNode is the abstract node of (ChannelSplitter, ChannelMerger)
X3DSoundDestinationNode is the abstract node of (AudioDestination, StreamAudioDestination)
X3DSoundProcessingNode is the abstract node of (BiquadFilter, Convolver, Delay, DynamicsCompressor, Gain, WaveShaper, PeriodicWave)

Not finding description or interfaces for
>
>   AudioContext → It is deprecated
>   BinauralListenerPoint → It is not different node, it is included in ListenerPoint
>   MicrophoneSource→ check the Report22_07_2020 (attached)
>   VirtualMicrophoneSource → Is it deferent from ListenerPoint?? We didn't decide it yet
>

>   TODO do these field go here or elsewhere in hierarchy?
>   SFNode   [in,out] transform   NULL [Transform] → It is deprecated
>   SFNode   [in,out] panner   NULL [Panner] → It is deprecated
>   SFNode   [in,out] filter   NULL [BiquadFilter] → It is deprecated
>   SFNode   [in,out] delay   NULL [Delay] → It is deprecated

> 3. Inheritance questions
>
> In several cases you have inheritance such as
>
>   BiquadFilter : SoundProcessingGroup
>
> What does SoundProcessingGroup correspond to? → SoundProcessingGroup abstract node has been replaced by
                                        X3DSoundProcessingNode
>

4. ListenerPoint and BinauralPoint. → We can discuss it in the call

a. The following fields should be SFVec3f or SFRotation for type safety. Think about animation, we want to be able to use PositionInterpolator and OrientationInterpolator (for example) to animate these points.

  SFFloat [in,out] positionX 0 (-∞,∞)
  SFFloat [in,out] positionY 0 (-∞,∞)
  SFFloat [in,out] positionZ 0 (-∞,∞)
  SFFloat [in,out] forwardX 0 (-∞,∞)
  SFFloat [in,out] forwardY 0 (-∞,∞)
  SFFloat [in,out] forwardZ -1 (-∞,∞)
  SFFloat [in,out] upX 0 (-∞,∞)
  SFFloat [in,out] upY 1 (-∞,∞)
  SFFloat [in,out] upZ 0 (-∞,∞)

Also note that if we are treating ListenerPoint similar to Viewpoint, we do not need to specify the upDirection vector. Viewpoint navigation already knows "up" since that is the +Y axis for the overall scene, as used by NavigationInfo already.

Suggested interface, matching X3DViewpointNode:

  SFRotation [in,out] orientation   0 0 1 0 [-1,1],(-∞,∞)
  SFVec3f   [in,out] position   0 0 10 (-∞,∞)

b. Next. Looking at interfaces,

===
BinauralListenerPoint : X3DAudioListenerNode {
  or
ListenerPoint : X3DAudioListenerNode {
  SFBool   [in]   set_bind
  SFString [in,out] description ""

```
  SFBool    [in,out] enabled    TRUE
  SFInt32   [in,out] gain    1    [0,∞)
  SFNode    [in,out] metadata    NULL [X3DMetadataObject]
  SFRotation [in,out] orientation 0 0 1 0 [-1,1],(-∞,∞)
  SFVec3f   [in,out] position    0 0 10  (-∞,∞)
  SFInt32   [in,out] gain    1    [0,∞)
# SFBool    [in,out] isViewpoint TRUE   # TODO needed?  rename?
  SFTime    [out]    bindTime
  SFBool    [out]    isBound
}
```

ListenerPoint represents the position and orientation of the person listening to the audio scene.
It provides single or multiple sound channels as output.
   or
BinauralListenerPoint represents the position and orientation of the person listening to the audio scene, providing binaural output.

5. Am completely lost by multiple entries of "Heritage from AudioNode" - did we miss an abstract node type? → NO, it is not a new X3D node. It is referred to the corresponding AudioNode from Web Audio API, but the attributes of this should be included in X3D.

8. SpatialSound

Similarly changed:
```
  SFFloat  [in,out] positionX 0 (-∞,∞)
  SFFloat  [in,out] positionY 0 (-∞,∞)
  SFFloat  [in,out] positionZ 0 (-∞,∞)
  SFFloat  [in,out] orientationX 1 (-∞,∞)
  SFFloat  [in,out] orientationY 0 (-∞,∞)
  SFFloat  [in,out] orientationZ 0 (-∞,∞)
```

to

```
  SFVec3f [in,out] direction  0 0 1 (-∞,∞)→ For me it seems ok
  SFFloat [in,out] intensity  1    [0,1]
  SFVec3f [in,out] location   0 0 0 (-∞,∞)
```

matching Sound node.

Potential problem: direction vector is hard to animate... typically if changed orientation is needed, then it is placed in a parent Transform, so we probably can leave it alone.

For SpatialSound, the "gain" field should be "intensity" in order to match Sound node. → For me it seems ok

Am avoiding abbreviations. Precise purpose of referenceDistance isn't yet clear to me.

I'm not clear about cone parameters... for now, changed degrees to radians. Please explain further, got diagram? → I will prepare it

If EQUAL_POWER is simple gain, is that the same as Sound node spatialize field?

Is there a way to specify HRTF, or (presumably) is that part of browser configuration? Those might be considered Personal Identifying Information (PII) and so am in no hurry to support that; might be part of WebXR.

Perhaps HRTF should be a simple boolean, in combination with the spatialize field. Seems simpler and sufficient.

9. Still needed, perhaps distilled from paper or Web Audio API? → It is not needed

16.2.3 Sound effects processing
Sound streams can be manipulated by a variety of sound effects...