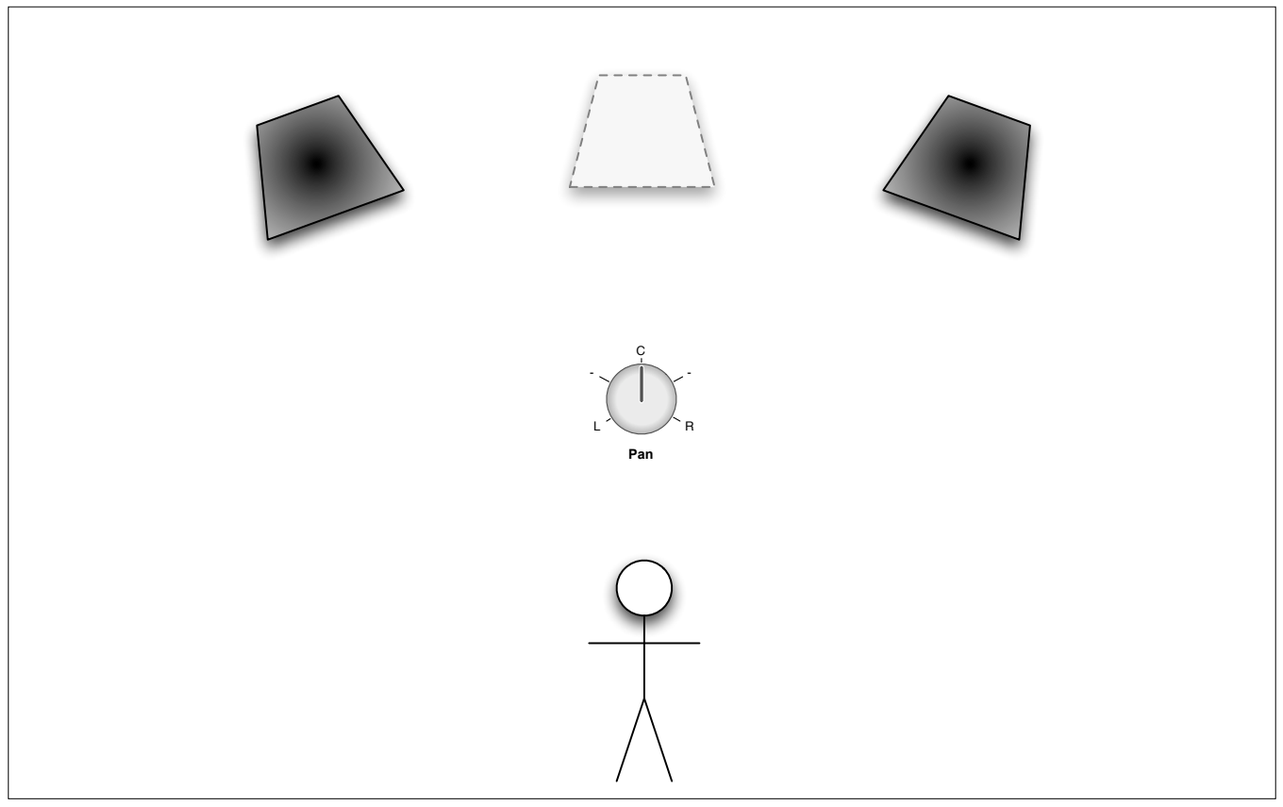
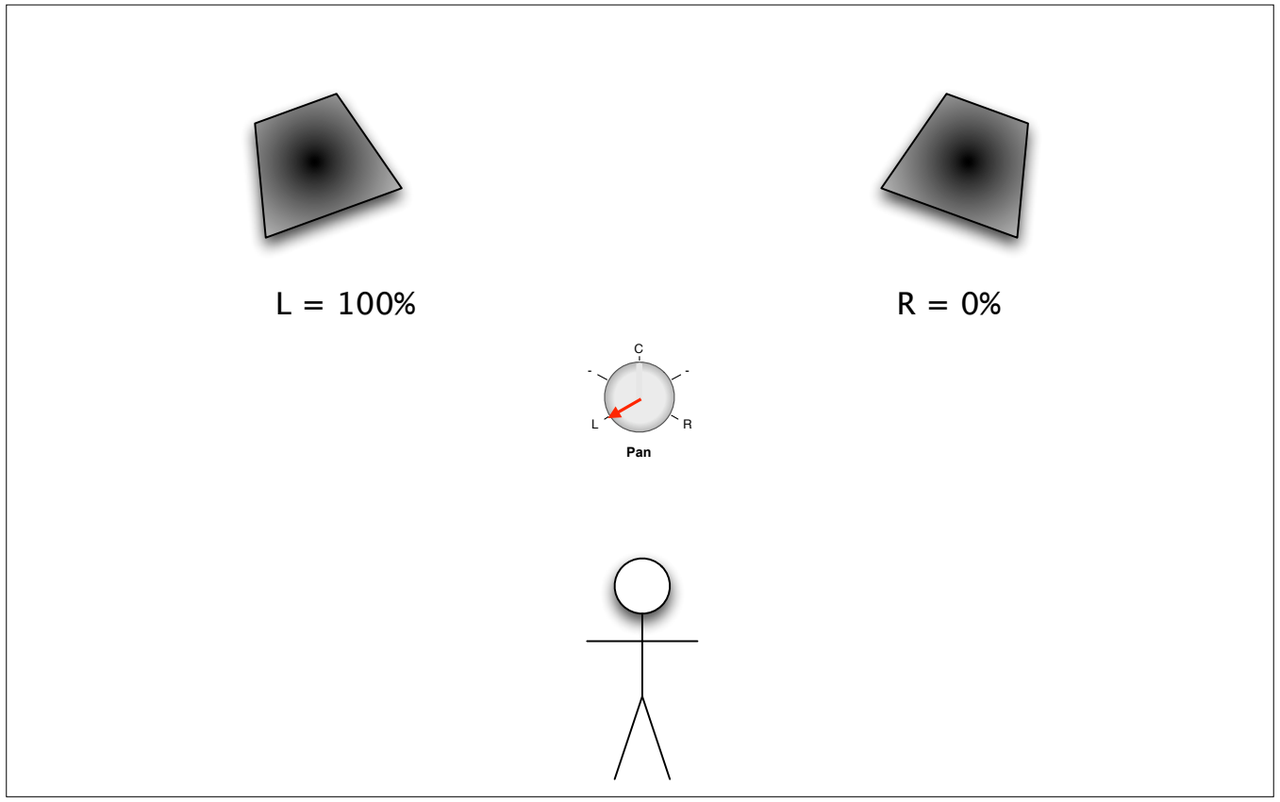
The Panpot

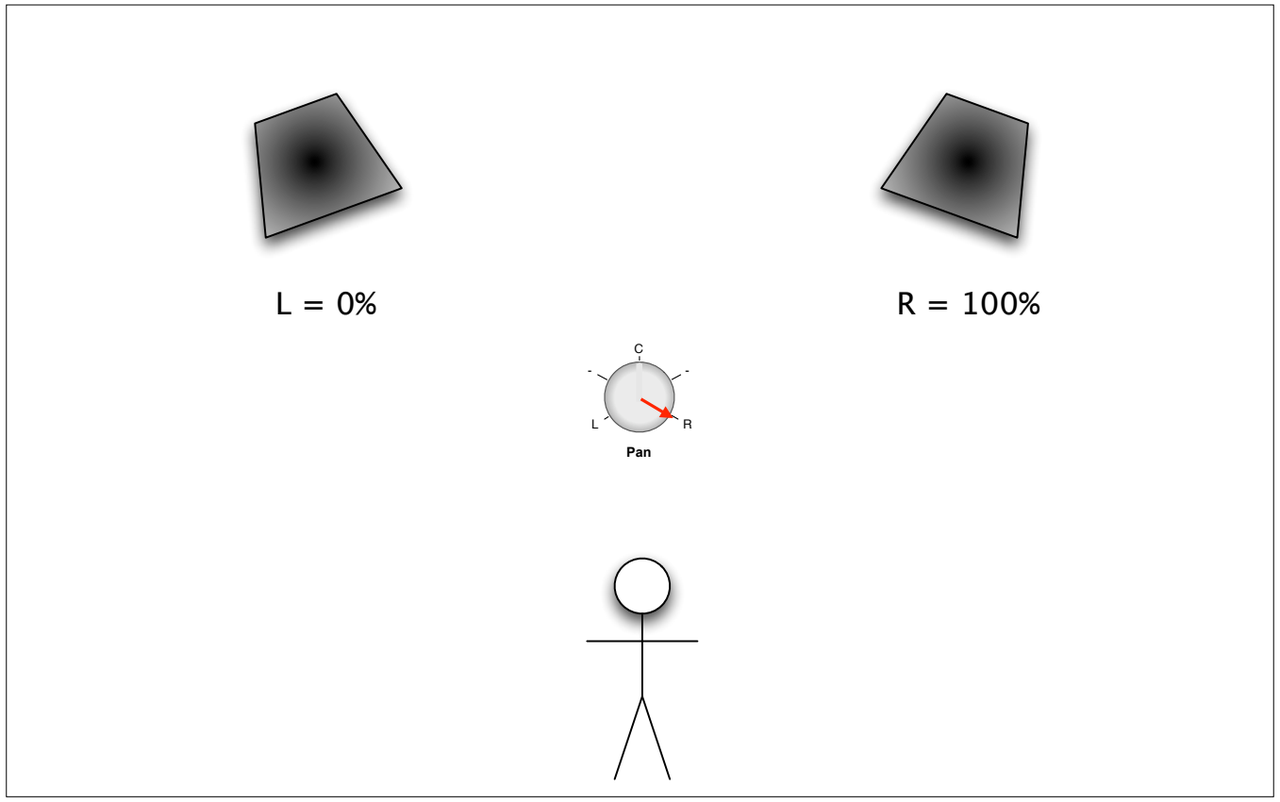
Let’s first consider the “Pan Pot”



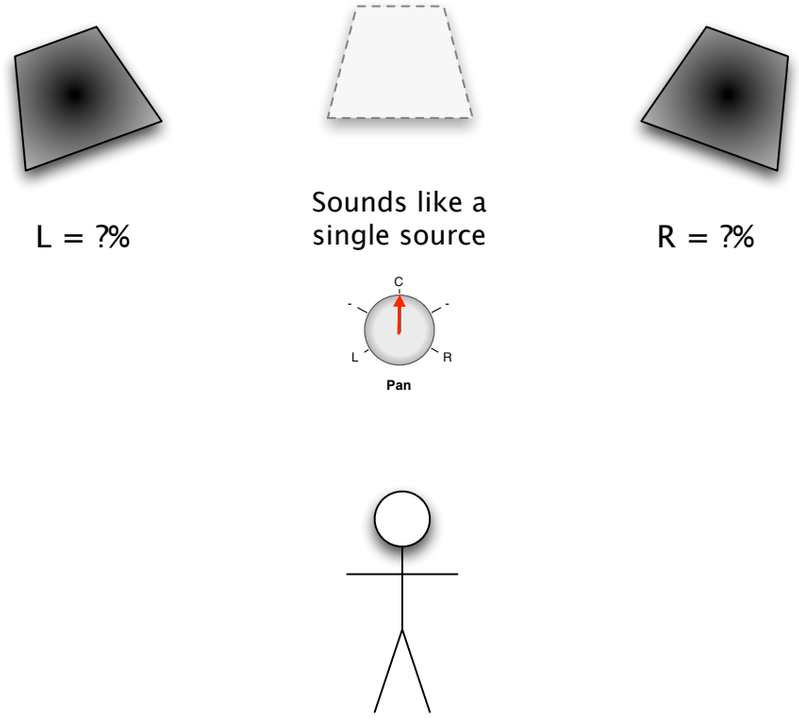
How does it work?
Virtual Center Loudspeaker



L + R = 100%



L + R = 100%



L + R = 100%...
the perceived intensity of two or more sounds played together is proportional to the square root of the sum of the squares of the individual amplitudes:

hearing perception

the perceived intensity of two or more sounds played together is proportional to the square of the sum of the squares of the individual amplitudes:
Equal Sound Power needed so that when we pan to the center we get the same perceived sound level as we do from one loudspeaker.

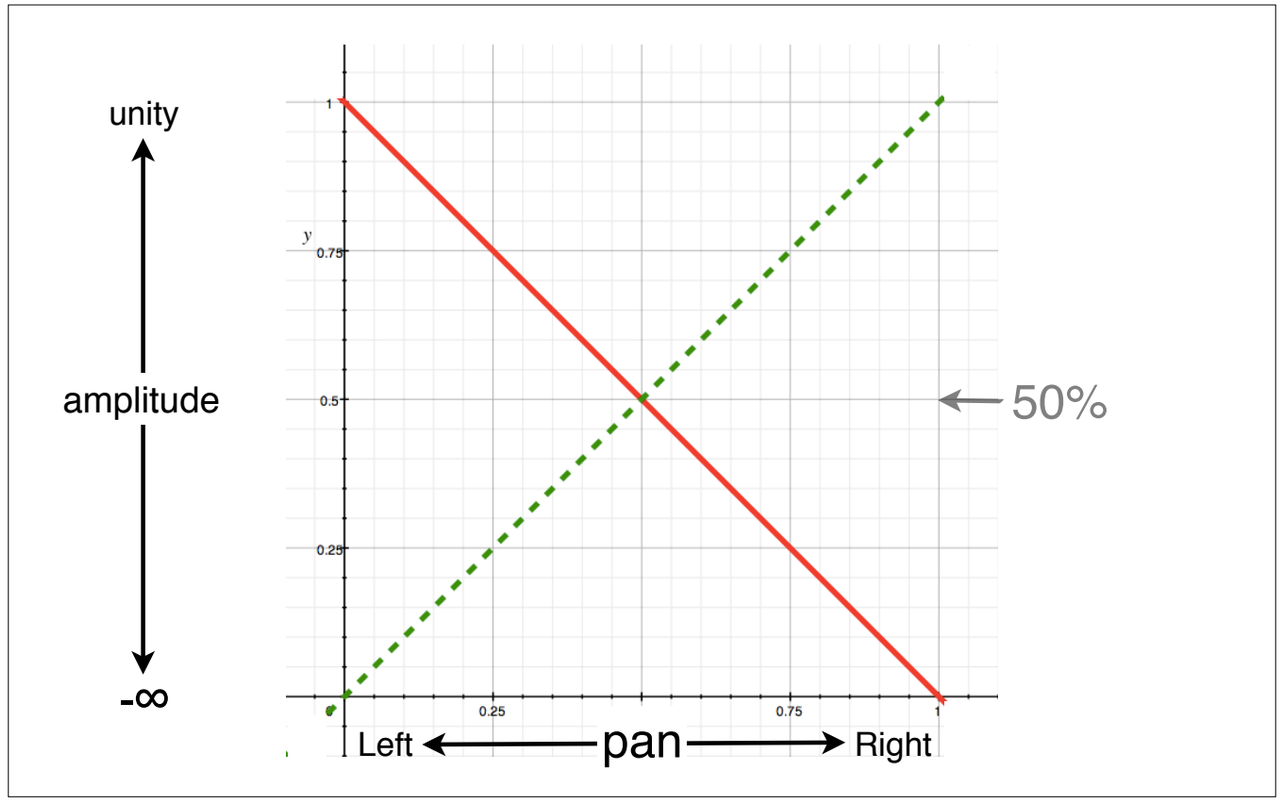
The perceived intensity of two sounds played together is proportional to the square root of the sum of the squares of the individual amplitudes:

$$\sqrt{a_1^2 + a_2^2}$$ for two point sources

The perceived intensity of two or more sounds played together is proportional to the square root of the sum of the squares of the individual amplitudes:

Equal Sound Power is needed so that when we pan to the center we get the same perceived sound level as we do from one loudspeaker.

http://images.google.com/imgres?imgurl=http://www.drawingcoach.com/image-files/ear_drawing_1.jpg&imgrefurl=http://www.drawingcoach.com/drawing-realistic-ears.html&usg=__bTas3jhEHYQGthKejcVRKcEWptc=&h=419&w=300&sz=22&hl=en&start=2&itbs=1&tbnid=WrSfxozBUhUapM:&tbnh=125&tbnw=89&prev=/images%3Fq%3Dears%26gbv%3D2%26hl%3Den%26safe%3Doff



equal level...
hearing responds not to level, but acoustical power

Left = .5

Right = .5

$.5^2 = .25$

.25 + .25 = .5

$\sqrt{.5} = .7071$

$.7071 \neq 1$

Left = 1.00

Right = 1.00

$1^2 = 1$

1 + 1 = 2

$\sqrt{2}$ = 1.414213562373095

1.4142 ≠ 1

Left = .707

Right = .707

$.707^2 = .499$

.499 + .499 = .998

$\sqrt{.998} = .9998$

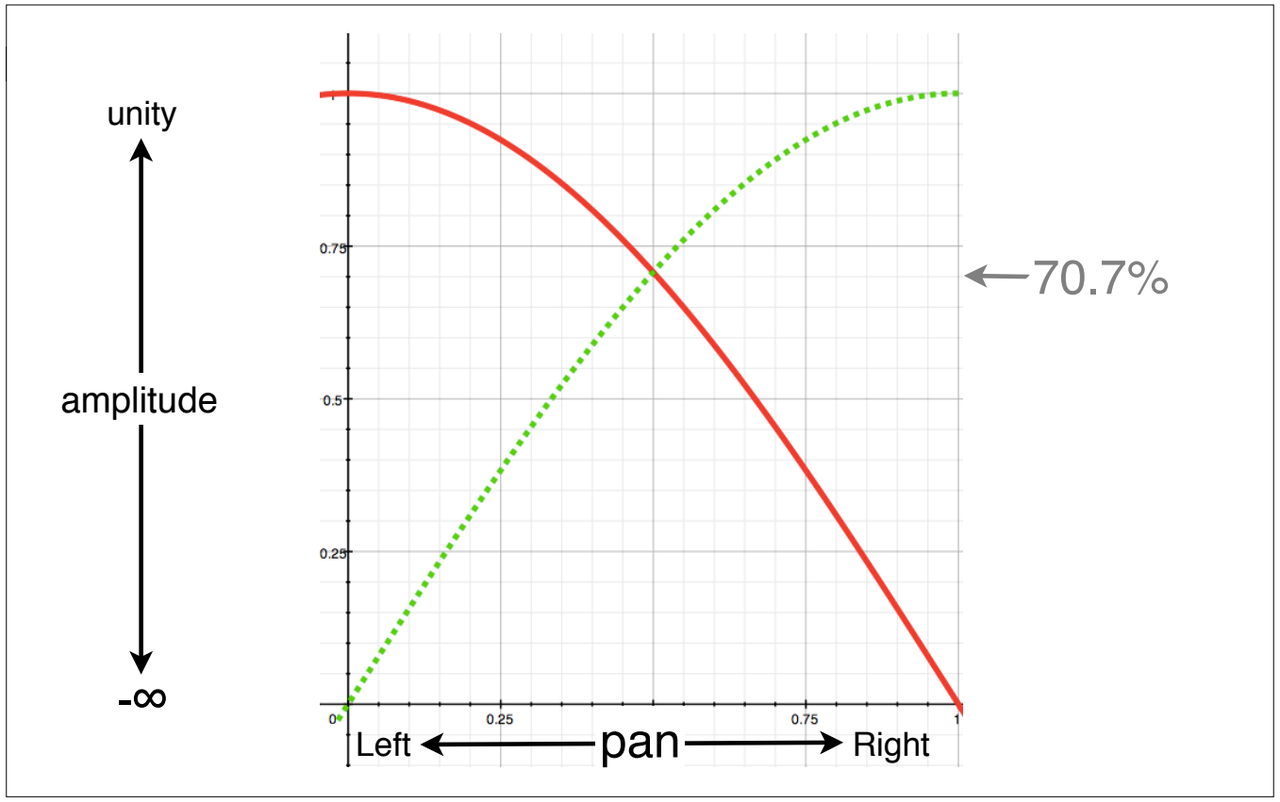
$.9998 \approx 1$

sin/cos pan

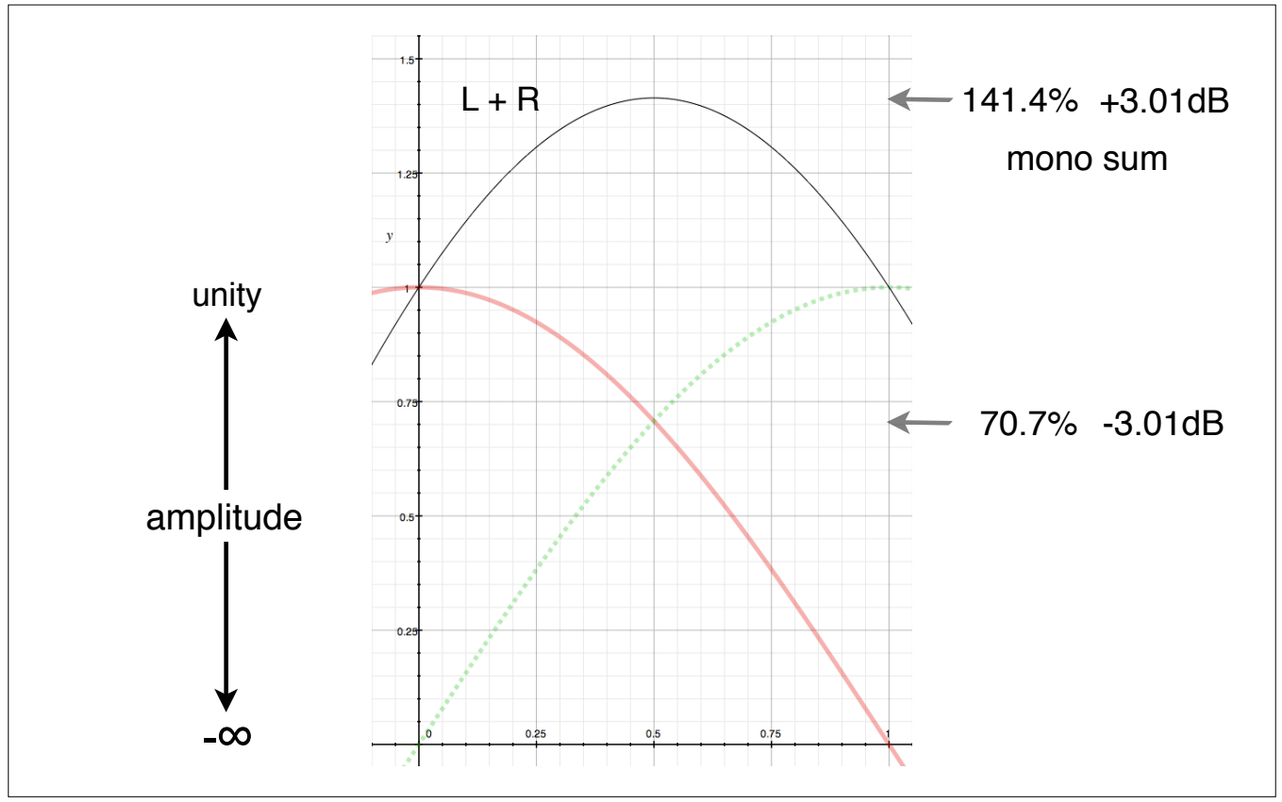
sin(π/2)*position

cos(π/2)*position

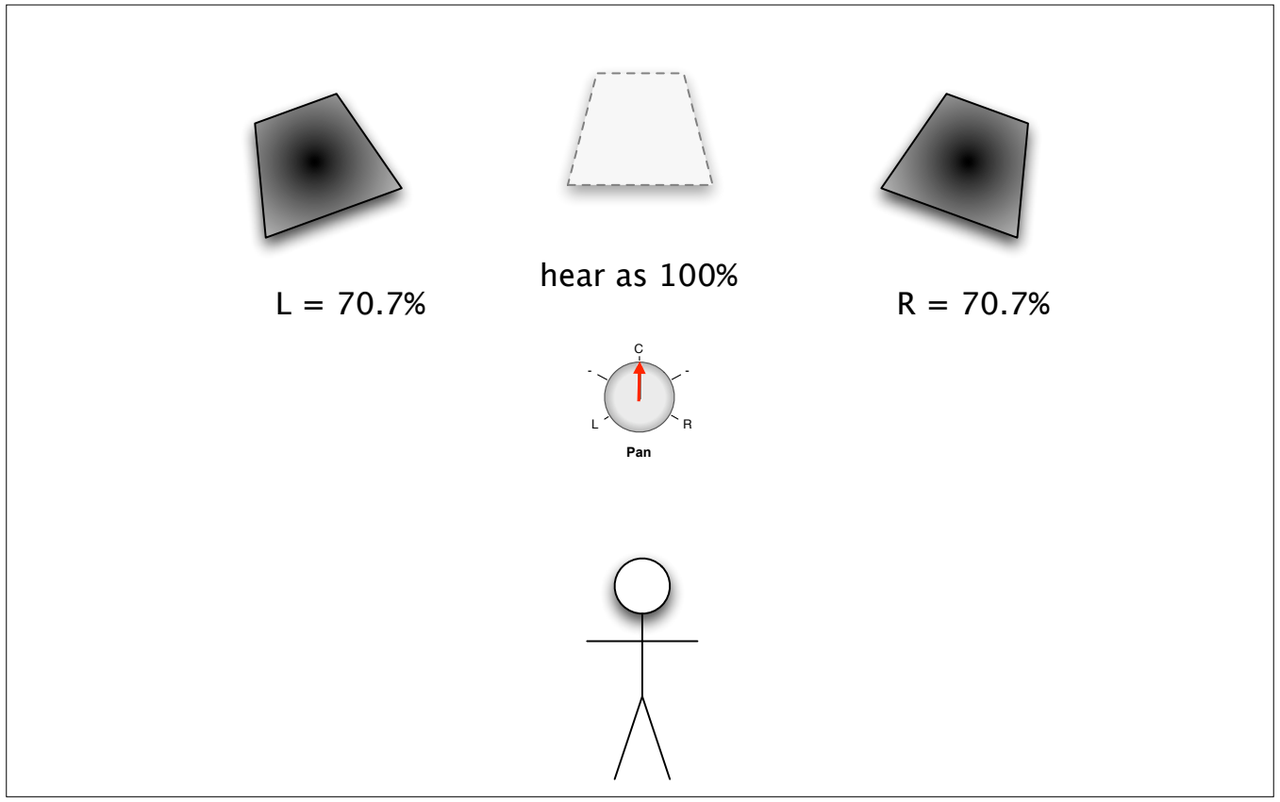
sin/cos pan
sin(π/2)*position
cos(π/2)*position



cos(π/2)*position
sin(π/2)*position
sin/cos pan



square root of the sum of the squares...
CAUTION: Bump when this is summed to MONO



the perceived intensity of two or more sounds played together is proportional to the square root of the sum of the squares of the individual amplitudes:

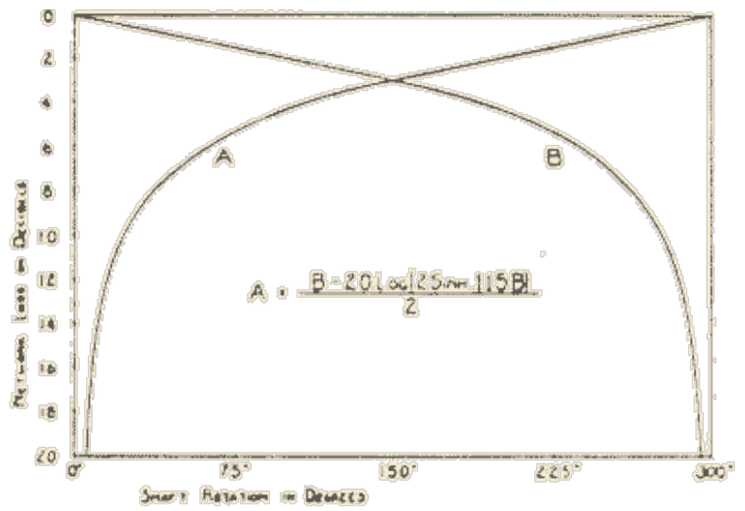


FIG. 1. Curves showing loss vs. shaft rotation of a typical two-circuit differential junction network. The cross-over point for the two losses is at −3 db.

Fantasound Pan Pot

A special two-gang volume-control was then designed with complementary attenuations in the two circuits such that the sum of the attenuations, *expressed as power ratios*, equaled a constant. The formula for the relationship between the two attenuations is:

$$A = \frac{B - 20 \log (2 \sinh 0.115B)}{2}$$

where A and B represent the two attenuations, expressed in decibels. Typical attenuation curves are shown in Fig. 1.

Mickey Mouse Goes Classical (Jan, 1941)
Popular Science
http://blog.modernmechanix.com/mags/PopularScience/1-1941/classical_mickey_mouse/classical_mickey_mouse_2.jpg