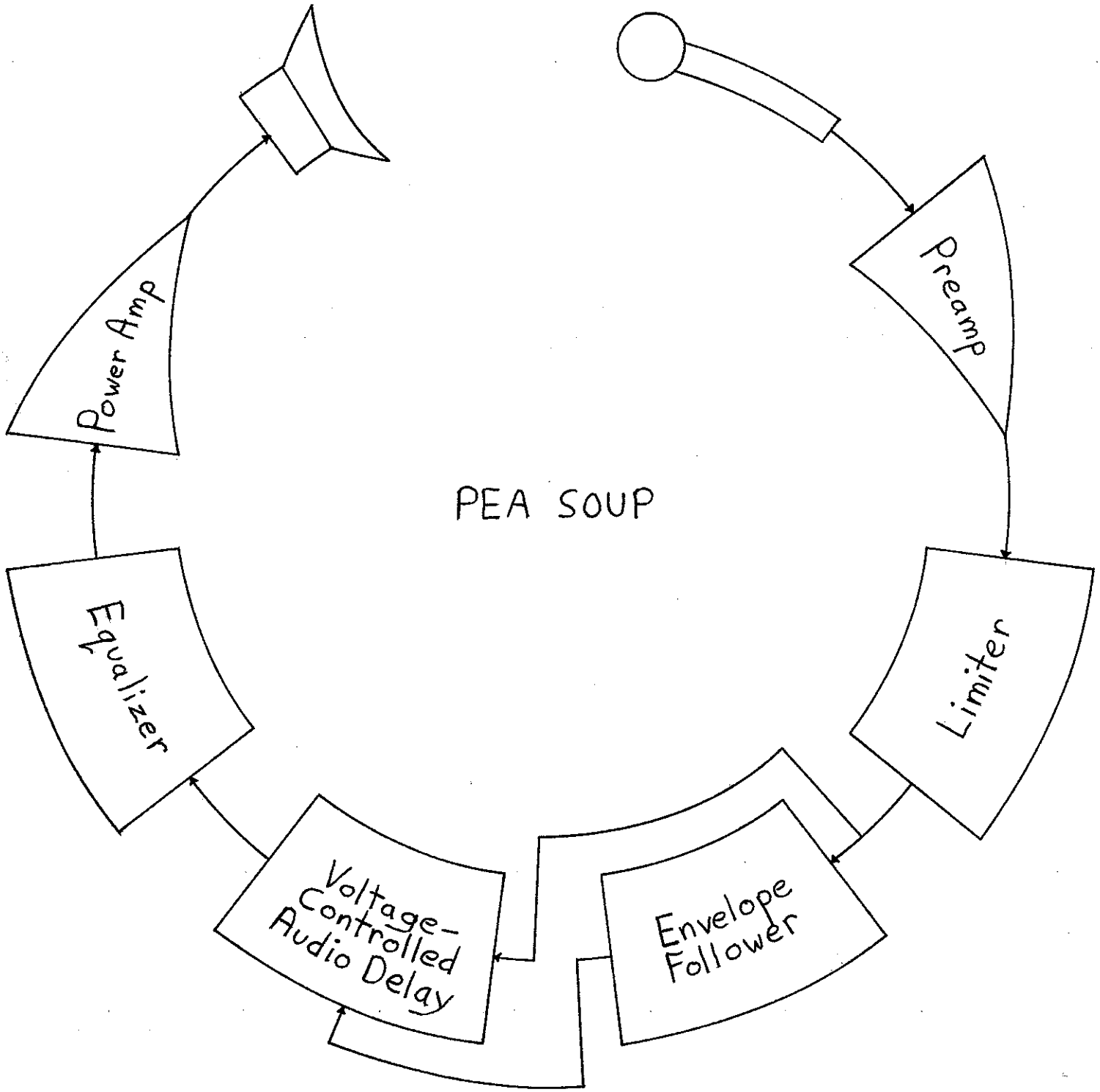
PEA SOUP
Preamp
Limiter
Envelope Follower
Voltage-Controlled Audio Delay
Equalizer
Power Amp

Pea Soup is a self-stabilizing feedback network that generates a sonic image of its immediate environment in response to certain basic acoustical properties of the space: the set of resonant frequencies (normal modes), the reverberation time, the level and pitch of ambient sound, the speed and paths of sound transmission, and the standing-wave patterns. Within a static architectural space some of these properties are constant, some vary according to meteorological conditions, and some can be influenced by human activity. Pea Soup can exist as a participatory public or private installation, or it can be presented in concert by performers who use instruments to manipulate the variable properties and thereby change the character of the image.

The Patch

Pea Soup uses a configuration of electronic components to shift the pitch of an audio feedback signal among various resonant frequencies of the air space in which it is operating. In a simple microphone-amplifier-loudspeaker loop feedback can occur at any frequency whose wavelength is integral both to the distance separating the microphone from the speaker and to at least one of the dimensions of the space. When a short (<30 ms), variable time delay is introduced into the feedback loop, it effectively changes the speaker-microphone distance

and therefore can be used to reinforce or cancel frequencies of different wavelengths.

In Pea Soup an electronic delay is produced by a Voltage-Controlled Phase-Shifter. The amount of delay is determined by an Envelope-Follower, which generates a control voltage that is, at any moment, directly proportional to the level of sound at the microphone. As the system begins to feed back at a particular frequency, the increasing amplitude of the signal causes a change in the delay time. This cancels feedback at the initial frequency and enables it to begin again at one that is resonant within the conditions established by the new delay time. The increasing amplitude of this signal causes another delay change, which cancels the second feedback frequency and enables another to begin. Once the system has been properly tuned this process of self-stabilization can continue indefinitely.

The acoustical properties mentioned earlier are the principle determinants of the characters of this process and the sonic "soup" that it generates. Feedback occurs at frequencies that are resonant to the air space; the speed with which it shifts is dependent on the reverberation time. Any sound, ambient or performed, picked up by the microphone increases the delay; in addition, the feedback tends to "follow" the frequency of pitched sound performed in the space. Any object or condition that

influences the transmission of sound from the speaker to the microphone alters the standing-wave patterns and consequently changes the sound level at the microphone. The speaker and microphone together define a "responsive field," within which the sounds, location, texture, and movement of objects and beings, and the density and motion of the air all affect the soup.

A Limiter is inserted into the loop in order to prevent high-level feedback signals from distorting or overloading the other devices. An Equalizer or the tone controls of an audio preamp can be used to balance the system for wide and uniform frequency response or to tune it to a specific operating range. The response pattern of the microphone (unidirectional, cardioid, omnidirectional, etc.) determinesthe shape of the field.

Set-up and Learning

Assemble any number of electronically independent channels of the Pea Soup patch within the chosen space. Position the speakers facing inwards from the periphery of the performance area. Distribute the microphones within the area; they may be mounted on stands, suspended, or fastened in any other appropriate way.

The location of the microphones and speakers in relation to each other and to the boundaries of the space delimits the full Pea Soup field and influences which of the resonant frequencies will be heard. Separate each

microphone from the speaker associated with it by a distance at least as great as the wavelength of the lowest frequency of feedback that you wish the loop to generate. When more than one channel is used, this distance should be different for each microphone-speaker pair in order to increase the number of possible frequencies in the soup.

The density of the soup is a function of the number of channels used and the total sound level. The power amplifier and microphone preamplifier level controls, the Envelope-Follower and Limiter slew times, and the control sensitivity of the delay all affect the speed and phrasing characteristics of the soup. The delay range and the Equalizer settings can be adjusted to maximize the frequency range of the feedback.

Tune the system so that it is stable enough to require no subsequent adjustment. For each such tuning find instruments that you can use to change the character of the soup: your body; other bulky, moveable objects; any acoustic or electronic sound producing device; any mechanism or material that can alter the density or motion of air within the space, such as sources of heat or coldness, compressed gases, or fans. Begin every performance with a careful tuning process prior to any other activities.

When you are still and silent the soup flows around you through the space. When you move, make a sound, or change the air, you displace some and disturb its flow.

When you stop, it returns, filling the place you previously occupied, following the sounds you made, and adopting a new pattern of circulation. Each pattern contributes a different perspective to the Pea Soup image.

Treat Pea Soup as an alien intelligent being who is attempting to gather information about her environment and its residents. The soup is both the tool with which she examines the space and the language by which she processes information and expresses her image of the space. Approach performance as an attempt to 1) facilitate her acquisition of information about the environment and you by inducing a variety of circulation patterns, and 2) learn her language and therefore begin to perceive the space through the soup.

Develop instrumental technique that is appropriate to the task of directing the flow of the soup. Derive performance realizations from your experiences.

Performance Suggestions

Movement

Set up several channels of Pea Soup in a performance space. Mount the microphones three to four feet above the floor. Tune the system so that it responds to movement in the field.

Walk slowly through the field. Pause after each step for the soup to react and settle fully. Perform slow,

simple, exploratory movements of your body while standing in place: turn your head or torso, raise an arm, lean, bend, crouch, etc. Do not perform any compound motions (i.e. turning while stepping or raising an arm) or any superfluous actions.

Pea Soup is sensitive to the size of movement and objects. Small movements or the motions of a small or narrow object (such as a hand, an arm, or the head) have the strongest effect on high frequencies. Movement of the torso affects both mid-range and high frequencies. A step forward usually affects the entire range of the soup.

Adopt Pea Soup's phrasing characteristics. Let your movement grow not from visual considerations but from a sensitivity to Pea Soup's manner of perceiving you.

The duration of the performance is determined by the length of time you take to move across the entire field.

Voice

Set up several channels of Pea Soup in a performance space. Mount the microphones four to five feet above the floor. Tune the systems so that it shifts through a wide range of frequencies and is responsive to pitched vocal sound.

You may begin and end a vocal performance in one

of two ways:

1) Tune the system. Enter and leave the field by following the suggestions for the performance of movement.

2) Walk to the center of the field. Have an assistant turn on and tune the system. Leave the field only after he has turned it off.

Stand in the center of the field. Listen: learn the pitch vocabulary and phrasing of the soup.

Perform the following tasks several times, in any order:

1) Begin a note in unison with a pitch that grows out of a silence or lull in the activity of the soup. Attack the note softly on a round "oo," (as in "soup"), "n," or "m" sound and increase to a loud "e" (as in "pea"). Sustain the "e" and detune it slightly until the soup cancels that pitch and shifts to a different one; then sharply release the note.

2) Begin a note out of a silence or lull; it should have a pitch that you have heard before, but one that is different from the one growing out of the lull at that moment. Attack the note softly on an "oo," "n," or "m" and increase to a loud "e." Sustain the "e" until the soup shifts to your pitch or to a harmonically related one; then sharply release the note.

3) Choose a soup-pitch that is not sounding at the

moment. Sing it as a short, loud "e" with a sharp attack and release. Pause for two or three seconds. Repeat the pitch but sustain it a little longer than before. Pause. Repeat it again but sustain it even longer. Continue this process until you have coaxed the soup onto this pitch or onto a related one.

4) Choose a soup-pitch that is not sounding at the moment. Sing it with a slow attack and sharp release ("oo"-"e"), a sharp attack and slow release ("e"-"oo"), or a slow attack and slow release ("oo"-"e"-"oo"). Repeat the note, with pauses, until you have coaxed the soup onto this pitch or onto a related one.

5) Learn a two or three note sequence from the soup. Mimic it as accurately as you can. Will the soup repeat it after you?

If, at any time, the soup locks on one pitch, sing a loud "e" an octave or two above and detune slightly until the soup cancels the pitch.

Make your performance very sparse. Sing no louder or longer than is necessary to coax the soup onto each new pitch. Pause after each event for the soup to react and settle fully. Follow Pea Soup's sense of time and phrasing. You may sing from different locations in the field, but do not sing while you are moving or while the soup is settling from your movement.

Changes of Temperature

1) Set up and tune several channels of the Pea Soup patch. Use any available heaters and air conditioners to change the temperature of the entire space as rapidly as possible between its greatest extremes.

2) Set up several channels of the Pea Soup patch in a space with a flat, smooth floor. Place the speakers on the floor, and mount the microphones on short stands or in mic-mice. Tune the system so that it is responsive to the movement of the heat sources used in the performance.

Provide each performer with a candle in a wide-based holder with a long string attached. Place the lit candles around the perimeter of the Pea Soup field. Lay the strings across the field, each leading to a point opposite its candle.

Pull the candles very slowly across the field.

Other small sources of heat, such as kerosene lanterns, Coleman lamps, oil lamps, butane lighters, blowtorches, or cans of Sterno, may be substituted for the candles.

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