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Research can be divided into five categories: 1) profile analysis research, 2) synchrony detection, 3) dynamic factors, 4) psychophysical methodology, 5) use of Dr. B. Berg's COSS technique to analyze profile experiments. We describe each category and indicate the publications that have resulted.

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Final Report
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AFOSR-88-0333

The following is a list of the research supported by the Air Force grant during the period September 15, 1988, to September 30, 1991. We also list the personnel who have contributed to the grant and their present status. I should also point out that the principal investigator was pleased to accept the Silver Medal in Psychological and Psychological Acoustics at the 1990 fall meeting of the Acoustical Society of America.

Basically the research can be divided into five categories: 1) profile analysis research, 2) synchrony detection, 3) dynamic factors, 4) psychophysical methodology, 5) use of Dr. B. Berg's COSS technique to analyze profile experiments. We describe each category and indicate the publications that have resulted.

1. Profile analysis. This topic continues to be our central research interest. The question is what are the factors that influence the human listener's ability to detect changes in a complex acoustic spectrum. Research on this topic has been greatly aided by the use of Berg's COSS technique described below. Publications include: 4, 6, 7, 17 and 22.

2. Synchrony detection. This topic refers to the fact that correlation or synchrony between the envelopes of different spectral channels can be used as an important detection cue. Our interest in this area was initially stimulated by Dr. Virginia Richards. It is similar to the research on comodulation detection first discovered by Hall and his colleagues. Publications include: 3, 8, 12, 18, 19, and 20.

3. Dynamic factors. We have had a continued interest in time varying spectra and want to understand how such variables influence the detection process. Our initial research centered on gap detection--the ability to hear a brief, silent interval in an otherwise study sound. In recent years, this research has involved simultaneous versus successive presentations in profile research. Publications include: 1, 2, 5, 17, 21, and 24.

4. Psychophysical Methodology. Because of the constant use of detection and discrimination tasks in our research, we are naturally interested in the most efficient use of these techniques in our estimate of detection and discrimination thresholds. Publications include: 9, 11, and 15.

5. COSS analysis. Dr. B. Berg developed a procedure that allows the experimenter to analyze detection data and infer the weight or saliency that the listener attaches to various elements of the

stimulus display. We have found this technique to be of particular value in understanding profile data. Following Berg's explanation of the technique (Pub. 10), we published a paper explaining its application to profile experiments (Pub. 14). Other publicati ns include: 13, 16, and 23.

PUBLICATIONS

1) Green, D.M. and Forrest, T.G., (1988) "Detection of amplitude modulation and gaps in noise." **Basic Issues in Hearing**, Edited by D. Duifhuis, J.W. Horst, and H.P. Wit, Academic Press.

2) Green, D.M. and Nguyen, Q.T., (1988) "Profile analysis: Detecting dynamic spectral changes." Hearing Research, 32, 147-164.

3) Richards, V.M., (1988) "Components of monaural envelope correlation perception." Hearing Research, 35, 47-58.

4) Bernstein, L.R. and Green, D.M., (1988) "Detection of changes in spectral shape: Uniform vs. non-uniform background spectra." Hearing Research, 32, 157-166.

5) Green, D.M. and Forrest, T.G., (1988) "Temporal gaps in noise and sinusoids." Journal of the Acoustical Society of America, 86, 961-970.

6) Richards, V.M., Onsan, Z.A., and Green, D.M., (1988) "Auditory profile analysis: Potential pitch cues." Hearing Research, 39, 27-36.

7) Raney, J.J., Richards, V.M., Onsan, Z.A., and Green, D.M., (1989) "Signal uncertainty and psychometric functions in profile analysis." Journal of the Acoustical Society of America, 86, 954-960.

8) Richards, V.M., (1988) "Aspects of monaural synchrony detection", **Basic Issues in Hearing**, Edited by D. Duifhuis, J.W. Horst, and H.P. Wit, Academic Press.

9) Green, D.M., Richards, V.M., and Forrest, T.G., (1989) "Stimulus step size and heterogeneous stimulus conditions in adaptive psychophysics." Journal of the Acoustical Society of America, 86, 629-636.

10) Berg, B.G., (1989) "Analysis of weights in multiple observation tasks." Journal of the Acoustical Society of America, 86, 1743-1746.

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11) Green, D.M., (1990) "Stimulus selection in adaptive psychophysical procedures." Journal of the Acoustical Society of America, 87,2662-2674.

12) Green, D.M., Richards, V.M., and Onsan, Z.A., (1990) "Sensitivity to envelope coherence." Journal of the Acoustical Society of America, 87, 323-329.

13) Berg, B.G., (1990) "Observer efficiency and weights in a multiple observation task." Journal of the Acoustical Society of America, 88, 149-158.

14) Berg, B.G. and Green, D.M., (1990) "Spectral weights in profile listening." Journal of the Acoustical Society of America, 88, 758-766.

15) Green, D.M. and Dai, H., (1991) "Probability of being correct with 1 of M orthogonal signals." Perception & Psychophysics, Notes and Comment, 49, 100-101.

16) Green, D.M. and Berg, B.G., (1991) "Spectral Weights in the profile bowl." The Quarterly Journal of Experimental Psychology, 43A(3), 449-458.

17) Dai, H. and Green, D.M., (1991) "Effect of amplitude modulation on profile-analysis detection." Journal of the Acoustical Society of America, 90, 836-845.

18) Richards, V.M., Heller, L., and Green, D.M., (1991) "The detection of a tone added to a narrow band of noise: Energy model revisited." The Quarterly Journal of Experimental Psychology, 43A(3), 481-501.

SUBMITTED FOR PUBLICATION

19) Raney, J., "Across-frequency interference produced by two-tone waveforms." Submitted for publication to the Journal of the Acoustical Society of America.

20) Raney, J. and Green, D.M., "Amplitude-modulation rate discrimination: Effects of carrier frequency, spectral cues and modulation depth." Submitted for publication to Journal of the Acoustical Society of America.

21) Dai, H. and Berg, B.G., "Spectral and temporal weights in Spectral-shape discrimination." Submitted for publication to Journal of the Acoustical Society of America.

22) Green, D.M., "Auditory intensity discrimination." Submitted for publication Springer Series in Auditory Research: Human psychophysics.

23) Berg, B.G., Nguyen, Q.T., and Green, D.M., "Discrimination of narrow band spectra: I. Spectral weights and pitch cues." Submitted for publication to Journal of the Acoustical Society of America.

24) Dai, H. and Green, D.M., "Auditory intensity perception: Successive versus simultaneous, across-channel discriminations." Submitted for publication to Journal of the Acoustical Society of America.

Personnel

The following people were supported from or contributed to the research carried out on the Air Force grant during the last three years. The current status of each is reported.

Technical Staff

Dr. Timothy Forrest, an assistant researcher in psychology, left the laboratory in the summer of 1989. He took a job as assistant professor in the Department of Biology at the University of Mississippi.

Dr. Virginia Richards was supported by an NIH postdoctoral fellowship, but greatly contributed to the Air Force grant. She left Florida in the summer of 1990 and is now an assistant professor in the Department of Psychology at the University of Pennsylvania.

Dr. Bruce Berg was an assistant researcher in psychology. He joined us in June, 1988, and left in June, 1991. He accepted a position as an assistant professor in the School of Social Science at the University of California at Irvine.

Mr. Tim Tucker left the laboratory to work in his own company, which makes electronic systems useful in psychoacoustic research. He consults for the laboratory about two days a month.

Ms. Zekiye Onsan has secured an H-1 visa and works part time on the Air Force grant as an engineer technician.

Mr. Quang Nguyen continues as a laboratory technician and programmer.

Ms. Mary Fullerton continues as the secretary and bookkeeper for the laboratory.

Postdoctoral Fellows

Dr. Sue Fallon finished her doctoral requirements at the University of Indiana. She joined us in August, 1989, and worked two months on the Air Force grant before beginning her NIH postdoctoral fellowship in January, 1990. She left the laboratory in July, 1991. She intends to pursue training in audiology.

Dr. Huanping Dai joined the laboratory on August 6, 1989. He received his doctoral degree from Northeastern University, where he was supervised by Dr. B. Scharf. He recently secured his H-1 visa and has been appointed an assistant researcher in psychology. He hopes to secure a permanent-resident visa.

Dr. Beverly Wright received her doctoral degree from the University of Texas where she was supervised by Dr. D. McFadden. She has been awarded an NIH postdoctoral fellowship and joined the laboratory in June, 1991.

Graduate Students

Dr. Jill Raney successfully defended her Ph. D. thesis in May, 1990. She is now in Amherst, Massachusetts, at the University of Massachusetts and is pursuing studies in audiology.

Mr. Gregory Canfield dropped out of graduate school in the summer of 1990 after completing his first year of study. He is uncertain about his future plans.

Mr. David Eddins received his B. A. and M. S. degrees from the University of North Carolina at Chapel Hill, where he worked with Dr. J. Hall. He has a Certificate of Clinical Competence in Audiology. He begins his second year of graduate study at Florida.

Mr. Zhou Bin came to the laboratory from mainland China. He received his undergraduate degree in acoustics from Nanjing University. He also has advanced training in acoustics from the Wuhan Institute of Physics. He is beginning his second year of graduate study at Florida.

Ms. Jung-mee Lee is a student from South Korea. She received her B. A. from Seoul University. She is beginning her second year of graduate study.

Ms. Xiang Gu is an entering graduate student from Beijing China. She was a graduate (1979-1983) of the physics department at the University of Nanjing, where she specialized in acoustics. She had been working as an engineer at the Research Institute of TV and Electroacoustics in Beijing.

Sabbatical visitors

Dr. Jan Zera of the Chopin Academy of Music, Warsaw, Poland, arrived in the fall of 1990. He is a Fulbright Fellow. He will complete his second year at the laboratory in June, 1992.

Dr. Edward Ozimek of the Institute of Acoustics, Posnam, Poland, arrived in November, 1990, and returned to Poland in June, 1991. He was the recipient of a Kosciuszko Foundation Fellowship.