

ECE4884 / 4007 Project Summary

Project Title	s.c.r.e.a.m. - System for the Creation of Random Electronic Adaptive Music
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Project Abstract (250-300 words)	<p>The System for the Creation of Random Electronic Adaptive Music (s.c.r.e.a.m.) is a framework for the generation and synthesis of random music. Based on the experimental work of John Cage, Karlheinz Stockhausen, and others who questioned and helped reformulate the definition of music, the system allows for the generation of any possible genre of music.</p> <p>The s.c.r.e.a.m. will interpret predefined probabilistic models and use them to influence the structure of the music it creates. These models can be easily configured, so that the type of music the system creates can be easily modified. The s.c.r.e.a.m. is made up of several smaller components; this modularity allows for further easy modification of the system's functionality. The framework allows for an arbitrary number of instruments to be used; the instruments themselves are open-ended and therefore any collection of sounds can be implemented as an instrument. This allows for almost endless possibilities. The system also allows for an arbitrary number of environmental sensors that can modify the music.</p> <p>The framework of the s.c.r.e.a.m. will be written in mainly C and C++, conforming to C99 and ISO C++ standards. It will be structured as a set of extensible libraries, furthering modularity and allowing easy design modification.</p> <p>This project seeks to create the s.c.r.e.a.m. and a simple implementation of it. This simple implementation will use the s.c.r.e.a.m. framework to create simple music of a single genre using a small number of instruments. It will have a few environmental sensors; one of these will be a microphone that can add sounds from the environment into the music. Once completed, the finished project will produce simple musical output that can be easily recognized as music.</p>

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List codes and standards that significantly affect your project. Briefly describe how they influenced your design.	C and C++ are being used to write the code. Therefore, s.c.r.e.a.m. is affected by the C99 and ISO C++ standards, which it will conform to. The project will also use the types specified in stdint.h.
List at least two significant realistic design constraints that applied to your project. Briefly describe how they affected your design.	<ul style="list-style-type: none"> - The s.c.r.e.a.m. system cannot be adaptable to every possible form of music. Therefore, we are forced to leave the system as open-ended as possible, but the possibilities of the system cannot be infinite. - The sensors of the s.c.r.e.a.m. cannot possibly detect every environmental change. The system is then forced to only use a number of sensors and is only able to monitor certain environmental changes.
Briefly explain two significant trade-offs considered in your design, including options considered and the solution chosen.	<ul style="list-style-type: none"> - Several audio libraries were considered for output of the system. The SDL and JACK libraries were highly considered; however, the JACK library was chosen due to its simplicity and the ease with which one can write code for it. - Each component of the s.c.r.e.a.m. must communicate. A couple of methods were discussed for communication. C-style sockets, simple bash pipes, file I/O, and all-purpose pipes were all considered. In the end, using all-purpose pipes was the best solution. Though it is not the fastest method of communication in some situations, it allows for many different means of communication; TCP/IP, local system, and other methods are all possible.
Briefly describe the computing aspects of your projects, specifically identifying hardware-software tradeoffs, interfaces, and/or interactions. <i>Complete if applicable; required if team includes CmpE majors.</i>	The s.c.r.e.a.m. is, by its nature, a computing project. It is implemented almost entirely in software, with only the environmental sensors being hardware. Interfaces for the s.c.r.e.a.m. are all in software; therefore, environmental sensors will require software programming to connect to the s.c.r.e.a.m. and transmit data. The project is also very modular; each particular component of the s.c.r.e.a.m. will be a separate process, and will communicate through pipes, as described earlier.