NLS TELECONFERENCING FEATURES: THE JOURNAL, AND SHARED-SCREEN TELEPHONING

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ABSTRACT

NLS is an extensive system of computer aids being evolved toward supplying a coherent, comprehensive environment in which a knowledge worker can do all of his central, everyday work. Support for collaborative dialogue among distributed participants is one important component of the system.

The Journal is an NLS subsystem with basic methods for handling full-text computerized items that parallel those of open-literature professional journals and associated library services -- i.e., a permanent record of any published item, citation conventions by which later readers can retrieve and access references to other items, and catalogs and indices for retrieval aid. Each of these processes is done much faster in our computer environment, and other computerized services may be added. Altogether this provides a very powerful foundation for a new level of collaboration via recorded dialogue.

The Shared-Screen Telephone option for conference collaboration stems from a special "connection" feature in NLS that enables mutually agreeing users of Display NLS (DNLS) to connect through the computer system, sharing the same NLS control and display portrayal. When simultaneously talking on the telephone and making use of NLS's other extensive features, two people can confer very effectively at great distances.

Our experience with these teleconferencing provisions brings out two important points: (1) computer-aided teleconferencing is much enhanced when integrated coherently with effective computer aids for doing one's other knowledge-work operations, and (2) computer networks add critically important capabilities to this enhanced form of teleconferencing.

INTRODUCTION

One purpose of this paper is to publish a note about two powerful modes of computer-aided collaboration; the other is to highlight a poorly appreciated factor regarding the utility to be derived from computer networks -- how these networks will facilitate human collaboration in a unique and powerful way.

The teleconferencing features described in this paper are implemented as coordinated parts of NLS, the ON Line System developed at Stanford Research Institute over the past twelve years. A goal underlying the evolution of NLS is to provide an effective "workplace" in which a knowledge worker can keep his everyday working materials and do his everyday work. Providing him with a personalized, computerized workplace for "core" materials and tasks (akin to what his office provides for him) has been one of two main concerns. The other concern has been to develop a multi-computer, multi-tool framework wherein from this familiar workplace a user can reach through to access materials and tools from a rich marketplace of specialty services. We have a strong feeling that most people working in such an environment will want to reach through to work with other people at least as often as with computer services. References 1 and 2 provide useful framework fill-in regarding our goals and approach.

There are tens of thousands of hours of accumulated experience in using NLS to do real work, spreading back over a decade with hundreds of people. The Journal system, with over twenty thousand items in it, is a regular part of the working culture for perhaps a hundred people. The Network Information Center (NIC) has been serving users of the ARPANET since 1971. We have been supporting remote NLS users over the ARPANET in steadily growing numbers -- for four years through the NIC services, and for the last half through our Knowledge Workshop Utility service. The latter is a private, not-for-profit venture launched by SRI to provide subscribers with what for a very advanced system is a very solid computer service. The Utility brings NLS computer aids into terminals in the subscribers offices for exploratory application by their people on their knowledge work. Also, the Utility has a staff of trainers that circulate between subscriber sites to help develop basic knowledge and skills, help iron out the problems in a group's evolution into different ways of working, and transfer application lore.

Our orientation and work methods have produced an approach to knowledge-workshop development and application that seems fundamentally usable for any special area of facilitation, i.e., whether it is for project documentation, intra-group collaboration, special-interest group bibilographic citation management -- or, for teleconferencing. Our goal is to establish enough daily users of an advanced system so that a particular service sub-system (such as a mode of teleconferencing) can be tested and evolved in an environment which will closely resemble that of the future. As we see it, tomorrow's users will be people working purposefully on daily tasks in a computerized workplace, and the subject sub-system will be employed within a sequence of other work operations that enrich the possibilities for harnessing it while providing a balanced view of cost, payoff, relative value among intangibles, and so forth.

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Citation practices -- For a true dialogue to work within this system, careful conventions must be followed about citing previously published items. An important value derived from the above storage and access provisions is that when one author wants to write about the work of another, he can cite it explicitly in his text with assurance that his reader has a straightforward way to access the cited work. Where this cited-work accessibility is dubious, an author is considerably burdened.

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The IDENT directory contains for each recipient a specification as to where and how his "mail" is to be delivered. Each recipient has a specially designated "mail box" section in his mail-reception file. For a short item, a formatted citation header and a complete copy of the text are automatically delivered into this mail box. For longer items, only a citation is delivered, containing title, author IDENT, date and time of submission, any associated author comment, a tag for either "Action" or "Info Only" classification, and a computer-useable citation link to the full text. The recipient can follow the link to read the item online, or else to produce a hard-copy printout.

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Since whole documents may be submitted to the Journal it is common practice to submit trial designs and thinkpieces, inviting comment that will appear as a collection of items that cite various sections (or the whole) of the trial piece and often cite other response items as well. Such a sequence has a function similar to other computer-message teleconferencing systems that record a "conference session". Here, though, any item may also be part of other "sessions," or may have citation links to any item at large that a participant may feel is relevant.

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uniquely effective -- corresponding to an in-person conference around a collective assemblage of their scratch pads, working records, and individual support facilities. To add extra power to such sessions, special conferencing-aid tools and conventions can certainly be developed to advantage.

But consider the great potential already existing when some of the participants -- or even a single participant -- can effectively use computer tools to work with the relevant materials and processes. There is great value in merely conducting themselves as though they were congregated at a magic blackboard -- each easily able to pull forth materials from his notes or familiar reference sources, copy across into his private workplace any material offered from what the other brings forth, and actually demonstrate his own methods, conventions, and special skills, or demonstrate the circumstances where he has trouble and would like advice. There can be sessions for coaching, reviewing, mutual problem solving, demonstrating, etc. The more comprehensive and efficient the collective tools and skills are for doing a single individual's kind of work, the more effective such collaborative sessions can be.

**IMPACT OF COLLABORATION ON NETWORK UTILITY**

Both of these types of collaborative dialogue will undoubtedly need to be generalized in the future. A computer-supported worker would like to connect to many different people in shared-screen, telephoning mode, eventually as a generalized option to telephoning. And sharing in recorded dialogue can't help but be an extremely important foundation for group effectiveness. We must acknowledge that the march of technology will allow us to record ever broader dialogue media for effective studying, and integration, leading to the day when a shared-screen telephoning session, with full video connection of participants' images, can be captured at total, within digitized data forms, to be submitted as an item of recorded dialogue so others can later benefit from the record of the real-time conferencing.

Consider the mutual implications of these possibilities for technologically supported collaboration and the potential growth of computer networks. It is obvious that the richer the set of tools and online working practices of the participants, the more striking the value will be of either of these modes of teleconferencing, and therefore the faster the growth in seriously used collaboration techniques. Also, the value of the computer-held workplace will be considerably enhanced through networking to bring a dynamic marketplace into life.

It is obvious that the collaboration will not be served effectively by merely connecting the participants' terminals to each other, or even by connecting to each terminal through a common, central support system. What is necessary is broadband interconnection between the processes of the participants' respective home workplaces. Other than with networks, how could this broad-band coupling sensibly be provided for collaborators whose

home workplaces are supported in different machine systems?

Reference 4 provides a framework description of how a community of knowledge workers, joined in either a common mission or by a common discipline, could become considerably more effective if they availed themselves of a coordinated set of information services. The first-listed service is "collaborative dialogue." The premise of the paper is that the data, computer processes, and terminals are tied together by computer networking; and the most basic issue is that the human resources -- knowledge, skill, creativity, intelligence, and drive -- are the important things to bring together. For human beings to collaborate effectively in the future through coordinated information systems, it seems unquestionable to me that computer networking is the inevitable foundation upon which communication will rest.

**ACKNOWLEDGEMENTS**

The research and development for the described work has been supported by several sponsors over the past years: the Information Processing Techniques Office of the Defense Advanced Projects Research Agency has given strong basic support over the entire period; the Air Force's Rome Air Development Center has been a steady supporter; the Office of Naval Research provided key support for some of the particulars in managing Journal catalogs; NASA's Langley Research Center gave parallel support with ARPA during the Journal System's formative years. Staff at SPI who have contributed particularly to concept and implementation are William Duvall, Paul Evans, Jon Hopper, Charles Iroy, and Jeannie Worth.

**REFERENCES**


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Consider the mutual implications of these possibilities for technologically supported collaboration and the potential growth of computer networks. It is obvious that the richer the set of tools and online working practices of the participants, the more striking the value will be of either of these modes of teleconferencing, and therefore the faster the growth in seriously used collaboration techniques. Also, the value of the computer-held workplace will be considerably enhanced through networking to bring a dynamic marketplace into life.

It is obvious that the collaboration will not be served effectively by merely connecting the participants' terminals to each other, or even by connecting to each terminal through a common, central support system. What is necessary is broadband interconnection between the processes of the participants' respective home workplaces. Other than with networks, how could this broad-band coupling sensibly be provided for collaborators whose home workplaces are supported in different machine systems?

Reference 4 provides a framework description of how a community of knowledge workers, joined in either a common mission or by a common discipline, could become considerably more effective if they availed themselves of a coordinated set of information services. The first-listed service is "collaborative dialogue." The premise of the paper is that the data, computer processes, and terminals are tied together by computer networking; and the most basic issue is that the human resources—knowledge, skill, creativity, intelligence, and drive—are the important things to bring together. For human beings to collaborate effectively in the future through coordinated information systems, it seems unquestionable to me that computer networking is the inevitable foundation upon which communication will rest.

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REFERENCES


