

AT&T INNOVATION BRIEFS

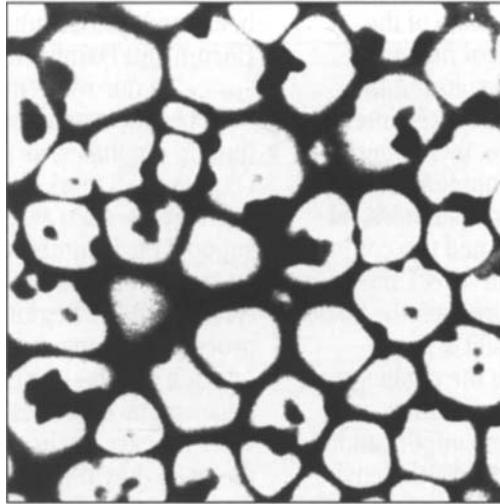
The briefs in this section are summaries of recent discoveries and developments within AT&T Bell Laboratories. AT&T readers who would like to contribute future items, and readers who would like further information as well, are encouraged to contact the AT&T Technical Journal editor.

TALISMAN Optimizes Route and Logical Network Designs

A software tool, TALISMAN (Tool for Analysis and Synthesis of Multirate ATM Networks) has been developed for the design and optimization of wide area asynchronous-transfer-mode (ATM) networks carrying switched virtual circuits (SVCs). Currently, its primary goal is the generation of optimum route and logical network designs. Several higher-level canonical problems also have been identified in dialogues with business-unit customers, and work is in progress to extend the tool. Written in C++ with standard components, TALISMAN is modularized to reflect the layered problem structure, each layer having a plug-in, plug-out module. The current version has three layers: network solver; implied costs, or sensitivity calculator; and optimizer. The optimization layer is integrated with AMPL, which enables the user to compactly describe the mathematical programming problem. TALISMAN undertakes call-level analysis in a stochastic framework, which SVCs make unavoidable, with all cell-level behavior encapsulated in the effective bandwidth formalism. The analysis contains some fundamentally new theoretical results, obtained to counter the massive anticipated demands on the numerics due to a large number of services (each with its own quality of service and bandwidth requirement) as well as transmission facilities with very large bandwidths. TALISMAN incorporates a unified hybrid approach, allowing asymptotic and nonasymptotic methods of calculation to be used cooperatively. This extends the scope of tractable problems and also increases numerical efficiency and accuracy. Additionally, TALISMAN addresses the problem of adapting the design to changing traffic conditions in near real time. This is implemented by a novel application of the statistical EM algorithm.

New Technology Enables Brighter Reflective Displays

Reflective displays are needed for portable products such as cellular phones, communicators, personal digital assistants, and hand-held computers. Incorporating displays that are reflective enough to be used without a backlight greatly reduces both the weight and power consumption of these products. The reflective displays currently used in portable devices are usually twisted or supertwisted nematic liquid



Microscopic structure of a PDLC. The polymer material (dark) has a foam-like structure filled with nematic liquid crystal (micron-sized light regions).

crystal. One drawback of these displays is that the reflected light is attenuated by several passages through polarizers, resulting in a dull black-on-gray display rather than a bright black-on-white display. A promising new technology for producing brighter displays is based on polymer dispersed liquid crystals (PDLCs), which are made of micron-sized liquid crystal droplets, trapped in a polymer matrix sandwiched between glass plates. If no electric field is applied, the orientation of the liquid crystal is determined by the droplet shape and is random between neighboring droplets. In this state, the PDLC material will appear milky-white and opaque, since light is strongly scattered as it passes through droplets of different orientation. By applying an electric field, however, one can orient all of the liquid crystals in the same direction, causing the material to become transparent. Thus, if a black backing is used in the display, the regions where the electric field is applied will appear dark. Since this technology requires no polarizers, PDLCs can be used to make reflective displays with a brightness and contrast similar to black ink on white paper. Moreover, these displays are simpler to assemble than twisted nematic displays since they do not require alignment layers. AT&T Bell Laboratories researchers have recently made advances in understanding the dependence of the electro-optical performance on droplet structure and size, and how to reproducibly achieve the desired microstructure through better process control. They also have discovered that surface interactions at the droplet walls have a profound effect on contrast and brightness, and can be manipulated to yield PDLCs that require very low switching voltages.

crystal. One drawback of these displays is that the reflected light is attenuated by several passages through polarizers, resulting in a dull black-on-gray display rather than a bright black-on-white display. A promising new technology for producing brighter displays is based on polymer dispersed liquid crystals (PDLCs), which are made of micron-sized liquid crystal droplets, trapped in a polymer matrix sandwiched between glass plates. If no electric field is applied, the orientation of the liquid crystal is determined by the droplet shape and is random between neighboring droplets. In this state, the PDLC material will appear milky-white and opaque, since light is strongly scattered as it passes through droplets of different orientation. By applying an electric field, however, one can orient all of the liquid crystals in the same direction, causing the material to become transparent. Thus, if a black backing is used in the display, the regions where the electric field is applied will appear dark. Since this technology requires no polarizers, PDLCs can be used to make reflective displays with a brightness and contrast similar to black ink on white paper. Moreover, these displays are simpler to assemble than twisted nematic displays since they do not require alignment layers. AT&T Bell Laboratories researchers have recently made advances in understanding the dependence of the electro-optical performance on droplet structure and size, and how to reproducibly achieve the desired microstructure through better process control. They also have discovered that surface interactions at the droplet walls have a profound effect on contrast and brightness, and can be manipulated to yield PDLCs that require very low switching voltages.