

NCSU based team applying computer design in making shoes

Shopping for comfortable, fashionable, reasonably priced shoes can be an ordeal for anyone.

For people with foot disorders, the choice is even more difficult. Their problems usually call for customized orthopedic footwear that takes months to make and can be very expensive.

In a project based at North Carolina State University, and interdisciplinary team of researchers is applying the principles of computer-aided design and manufacturing, or CAD-CAM, to the challenge of making quality custom shoes more quickly and at lower cost.

"A pair of orthopedic shoes can take months to produce by hand at a cost of between \$400 and \$700," said Dr. Han P. Bao, NCSU professor of industrial engineering. Bao is chief investigator for the study, which is exploring the feasibility of automated production of custom shoes.

Bao's team has developed a prototype CAD-CAM system for delivering shoe last—forms, shaped like the human foot, used by shoe manufacturers to produce foot measurements and translates them into instructions for a machine that produces the last.

Bao, an expert in the design of flexible manufacturing systems, said some 9.5 million pairs of custom footwear are requested annually in the United States.

"These requests come from people whose foot disorders usually result from trauma and biomedical conditions or may be secondary to diseases such as arthritis, diabetes and circulatory impairment," he said.

"With the number of skilled shoemakers declining rapidly and the increased demand, especially by the elderly, for custom shoes to prevent or alleviate foot disorders, there is a strong need to find ways to produce orthopedic shoes more quickly at less cost," Bao said.

The NCSU project is sponsored by the National Aeronautics and Space Administration (NASA) in association with the Veterans Administration.

"The Veterans Administration is particularly keen on obtaining an automated process for producing orthopedic footwear to serve the needs of its members with foot disorders," Bao said. NASA, which is interested in finding new uses for space technology, has provided specialized software for the project, he added.

The current practice for producing orthopedic footwear involves numerous manual tasks, ranging from making plastic foot models for producing shoe lasts to shaping a paper pattern for cutting and stitching.

In the feasibility study, Bao's primary task was to develop CAD-CAM databases for both foot shapes and shoe lasts for application to the machining process of custom shoe lasts.

"Our primary objective has been to use computer techniques to help reduce the manual time it takes to make individualized shoes," he said.

Project participants during the first phase have included:

Robert Wallace, a Research Triangle Institute engineer who coordinated and administered the project;

Dr. W. Bonner Guilford of the Department of Radiology at the University of North Carolina at Medicine, who provided photographic prints of different feet taken by CAT scanning, showing foot profiles and bone structures necessary for appropriate orthopedic prescriptions;

Arnie Davis of the Davis Shoes Therapeutic Co. of California, who provided knowledge of the manual fabrication process for custom orthopedic shoes;

Dr. David McAllister of the NCSU Department of Computer Science, who worked on the conversion of a three-dimensional surface into a two-dimensional surface for leather cutting; and

Karrie Finkel of the NCSU School of Design, who is studying the design aspects of generating shoe lasts and assessing the needs of patients.

Bao and his graduate student assistants recently demonstrated their prototype system. Using numerical

measurements of the foot generated by the CAT scan, the system displays a wireframe model on the screen of a graphics terminal. Shape modifications can be made at this stage to accommodate the special needs and measurements of the patients' foot.

Next, the numerical data model of the foot is manipulated to produce instructions for a computer controlled milling machine which generates the shoe lasts.

The initial work done by Bao and his colleagues paves the way for the design and implementation of a sophisticated yet practical computer-based system for automating the entire process of making orthopedic footwear.

Solving remaining problems, Bao said, will require a multi-disciplinary approach involving medical technologists, computer scientists and experts in various engineering fields, such as industrial, mechanical and electrical.

In the next phase of the project, researchers will look for less expensive ways than CAT scanning to take precise numerical measurements of foot for the computer model.

They will work on improving the graphic display to make it more realistic for the human designer. And Bao said the team will work to provide a transparent view of the bone structure within the outline of the foot to assist medical professionals.

"The experience gained in this project can be extended to the commercial footwear industry or to the production of any object with complex surface geometry—ornamental products, die coast of complex aircraft parts," Bao said.

Bao joined the NCSU faculty in 1981. He has been involved in both teaching and research in facilities design and material handling, industrial automation, computer-integrated manufacturing and design of advanced manufacturing systems. He also has been involved in projects sponsored through NCSU's Integrated Manufacturing Systems Engineering Institute.



Pictured above Walker Rayburn is seen as he shears a sheep last Friday. Mr. Rayburn provided this demonstration as part of the S.O.A.R. in Fun program which is being offered by the library in conjunction with the extension office, and the recreation department.

State eye physicians recommend extra eye care in the summertime

CHAPEL HILL, NC—As thousands of North Carolinians search for fun in the sun this summer, the North Carolina Society of Ophthalmology recommends extra eye safety precautions because too much fun in the sun can damage the eyes.

"With warm weather comes an increase in outdoor activities and increased eye hazards," said Dr. Kenneth L. Cohen, president of the society. "A variety of problems from sunburned eyes to outdoor sports eye injuries unfortunately is as common each summer as the souvenir sun-tan."

The physician noted that many summer sun worshippers are unaware that unprotected eyes are susceptible to sunburns until it's too late. "Because the summer sun is stronger than at any other time of the year, the eye's delicate tissue can easily be damaged by the sun's ultraviolet rays, even on cloudy days," said Dr. Cohen.

"But like sunburns of the skin, ultraviolet burns of the eye rarely show symptoms immediately," the physician continued. "Victims who stay out in the sun all day may not realize their problems until hours later. Some patients even report waking up in the middle of the night with intense pain and unable to open their eyes."

"It's important to have eye problems treated by an ophthalmologist immediately," he continued. "Fun in the sun is one thing, but too much fun in too much sun can lead to serious pain and vision disorders."

The physician noted that many common summertime eye injuries can be avoided through basic preventive techniques, such as wearing a good pair of sunglasses or safety goggles.

"High-quality sunglasses are an essential part of protecting your eyes during the summer," said Dr. Cohen, who also is an ophthalmologist at the University of North Carolina at Chapel Hill. "Sunglasses reduce the eye irritation that comes with summer's more intense sunlight, especially at the beach where the sand and water reflect the sun's bright light and ultraviolet rays."

Dr. Cohen said that neutral gray or smoke-colored lenses are most effective in blocking the sun's dangerous rays. The lenses should be large enough to shield most angles of vi-

sion, and should transmit no more than 30 percent of visible light. In particular, the physician encouraged contact lens patients to wear sunglasses while outside to protect against excess light, dust dirt, and wind that can damage their lenses.

When selecting a pair of sunglasses, consumers should examine the glasses for scratches, streaks, bubbles, blurs or other flaws by holding them up against a light. While plastic lenses are lighter to wear than glass one, Dr. Cohen cautioned that they are more susceptible to scratches and distortions.

To check the quality of sunglasses' lenses, the physician suggested holding the glasses at half an arm's length and focusing on an object with strong vertical or horizontal lines. If the lenses are distorted and should be avoided. Although lenses distortion is not in itself harmful, Dr. Cohen noted that it makes the eyes work harder and can cause squinting, blinking, tearing and even headaches, nausea and dizziness.

Dr. Cohen also urged outdoor activists to exercise caution when playing warm weather sports. "Many summer sports involve small balls moving very quickly," he said. "Baseball, tennis, softball and volleyball are all great warm weather activities, but if a ball hits you in the eye, the results can be very serious. Underneath a black and blue shiner should be coular damage that can cause permanent vision impairment or blindness. Anyone who gets hit in or around the eyes should see an ophthalmologist immediately."

Dr. Cohen encouraged sports enthusiasts to wear protective goggles that cover the eye socket and the area around the eyes to prevent needles eye injuries. High-impact plastic goggles with elastic bands are best

and can be worn over regular glasses or contact lenses while playing summer sports.

The ophthalmologist observed that safety goggles and gloves also are recommended for protection against summer eye hazards that may be lurking in one's own backyard.

"Safety goggles are a must during summer tasks, like cutting grass or chopping firewood," Dr. Cohen said. "Flying wood chips from a chain saw or flying rocks from a lawn mower are like bullets and needlessly blind hundreds of people every year."

Even simple tasks such as pulling up weeds can cause eye injuries. "Every year, we see cases in which people get poison ivy on their hands while gardening and inadvertently spread it to their eyes, sometimes causing severe reactions. Also, many yardwork enthusiasts get stung in and around their eyes by bees, wasps and other insects that they disturb while gardening," Dr. Cohen said. "Gardeners can protect themselves from such eye injuries by wearing gloves and safety goggles when working in the yard."

"We want everyone to have a good time this summer, but at the same time we want to ensure proper eye safety," Dr. Cohen said. "People have a tendency to take their eyes for granted and may not plan ahead for safety measures. That's all we're asking—just use your eyes to look around for safer ways to enjoy those summer activities."

The N.C. Society of Ophthalmology is a group of more than 250 medical physicians with specialized training in the diagnosis and treatment of diseases and disorders of the eyes. Only an ophthalmologist can perform a comprehensive medical eye examination.

DMV to get new safety equipment

RALEIGH—The North Carolina Division of Motor Vehicles hopes it may soon have some new weapons to use in the war against trucks that break the state's weight and speed laws.

The DMV's Enforcement Section is asking for more "weigh-in-motion" equipment that will make spotting illegal trucks easier and more efficient. The weigh-in-motion units are high-tech portable scales that weigh portable scales that weigh trucks and record their speed as they travel on the highway. Currently, in most cases in North Carolina, trucks must pull off the road into a permanent weigh station to have their trucks checked by enforcement officers.

Weigh-in-motion equipment already owned by the DMV has greatly increased the effectiveness of North Carolina's enforcement effort. It allows officers to move from place to place, making it harder for truckers to avoid being weighed.

The additional equipment the division hopes to get is part of expansion budget request currently pending before the North Carolina General Assembly. The division is asking for \$800,000, enough to purchase six to eight of the units. If lawmakers approve the request, the equipment purchased by the division will be used at locations across the state.

Commissioner of Motor Vehicles William S. Hiatt is a strong supporter of weigh in motion equipment. "The

additional scales will allow us to check a lot more trucks than we can possibly check without them," Hiatt said. "The weigh-in-motion equipment is important to everyone who travels North Carolina highways and pays highway taxes, because it will make our roads safer and will help them last longer. Overweight trucks are dangerous and they tear up the pavement."

The DMV already has two portable weigh-in-motion units in operation. The units are popular with truckers who are running within legal speed and weight limits because they allow them to be checked without losing time and without paying the extra fuel cost that comes from stopping and starting a big rig.

Facts and information on wildlife

Britain recently dedicated what may be the world's first tunnel of love for toads. The 10-inch-wide tunnel, which runs 60 feet under a busy country road some 35 miles west of London, will enable lovesick toads to proceed safely to a nearby lake for romantic encounters. According to "International Wildlife" magazine, an estimated 20 tons of toads are squished each year on Britain's roads.

Who says males and females can't

be "just friends"?

Platonic friendships are quite common among African baboons. According to "National Wildlife" magazine, the male friends protect the females and their young from attacks by other members of the troop and often groom and cuddle the infants. A male's reward is an increased chance of eventually mating with the female, although he may have to wait for up to two years.

A record 141 million Americans

now participate in wildlife-related recreation activities, according to a recent study by the U.S. Fish and Wildlife Service. In 1985 more than half of all adult Americans engaged in such activities as feeding, observing or photographing wildlife, more than one in four fished, and about one in 10 hunted. Altogether they spent more than \$55 billion on equipment and transportation to pursue these pastimes. "National Wildlife" magazine reports.

Rhonda's Beauty Shop
Color, cut & curl
Men's Women & children
— HOURS —
Tues.-Fri. 9AM-5PM
Saturday 9AM-1PM
Owned & Operated by:
Rhonda Roberson
426-8371
Route 2 (Hurdletown Road Hertford)

INSIGHT INTO EYESIGHT
Dr. A.F. Downum
OPTOMETRIST
"TELEVISIONEYETIS"
No, this is not another new disease that you have to worry about. Generally speaking, watching television is not harmful to the eyes or to vision. UNDER PROPER CONDITIONS, there is much less focus strain involved in viewing TV than in doing close work such as reading or sewing. BUT, there are factors to keep in mind.
Don't sit too close to the screen. The ideal point for viewing is five times the width of the picture. With a 19" (diagonal) set, for example, this computes to be about six to seven feet. Children, especially, should be discouraged from sitting up close. If they persist, it might be a sign of near-sightedness.
Don't watch TV in a dark room. Most lighting engineers and optometrists recommend soft overall lighting for television viewing. When the room is totally dark, the contrast between the picture and the surrounding area is too great for comfortable and efficient vision.
Beware of signs of fatigue or watering of the eyes while watching TV. TV probably isn't the culprit, but this may indicate a vision problem which needs attention.
Dr. A.F. DOWNUM
103 W. Eden St.
Edenton, N.C.
Phone: 482-8444

COOL SAVINGS
FOR ALL THE FAMILY
LADIES SPORTSWEAR
• SKIRTS
• BLOUSES
20% OFF
LADIES SHOES (SELECT GROUP)
25% OFF
MEN'S SPORTSWEAR (SELECT GROUP)
OP SHIRTS
BATHING SUITS
CHILDREN'S WEAR
25% OFF
STONE
DARDEN DEPT STORE
Hertford—DOWNTOWN
BUSTER BROWN
CLOTHES & MORE
FOR BOYS & GIRLS