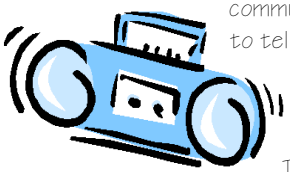
HARMONICS

The Engineering Explorations Newsletter

Volume 2, Issue 1
September 1998

WHAT IS COMMUNICATIONS ENGINEERING?

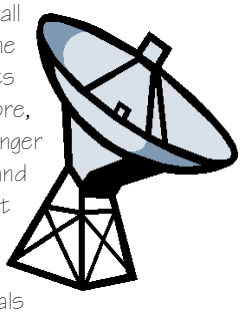
Communication is about telling stories and sending messages . It is something we all do every day with the people close to us: our family, our friends, our teachers. But what happens when we want to communicate with someone who is far away, or tell a story to a group of 1000 people in a large hall? That is when the expertise of a communications engineer is very helpful. At its root, communications engineering is about making it easier to tell stories or send messages over distance and sometimes to large groups of people by moving or amplifying electric (or light) signals.



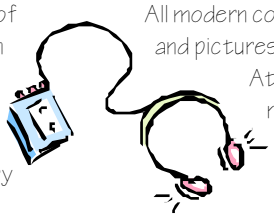
These days, communications has a lot to do with electronics, and so communications engineering is a sub-discipline of electrical engineering. Think about the electronic communication technologies you use every day - telephones, televisions, VCRs, radios, Walkmans, computers – a communications engineer helps to develop all of them. That same type of engineer designs satellites, phone lines, switches, and all other types of technologies and processes which make communication possible. You might think it's easy to pick up the phone and call your friend down the street or your aunt in another community, the whole process is designed by communications engineers to seem that way to you, but it's actually very complex.

No matter how big or small your community is, all the telephones in it are linked together through a central network which is connected by a grid of wires. When you dial someone's number, the first thing that happens is that the number travels along the wire from your house to the central network as an electric signal. When it gets there, a computer figures out who you are calling and rings the right phone. Then, assuming someone is home, it creates a connection between the two phones, and your conversation begins.

Your voice, unlike the number you dialed, isn't an electrical signal, so the first thing the phone does when you start talking is convert your voice. When you speak into a telephone, your voice – which like all other sound travels in waves - hits a thin , metal plate called a diaphragm. The diaphragm is attached to a magnet which sits inside, but doesn't touch, a coil of wire. When the sound waves of your voice move the diaphragm, it moves the magnet inside the coil. The movement creates a small electric current which is then transferred along the wire. Different sound waves cause different amounts of current. A loud voice moves the diaphragm more, which moves the magnet more, which causes a stronger current. As your voice changes in loudness and inflection, different amounts of current are sent along the telephone wire as electric signals. When the signals arrive at the other telephone, the whole process happens in reverse; the electric signals are changed back into sound waves and your friend hears you say "Hi!"



A communications engineer is involved in designing every step of the process which makes your conversation possible – except what you actually say!



All modern communications depend on electric signals. Sound and pictures are changed into signals and sent along wires. At the other end of the wires, the signals are received and changed back into sound and pictures. Sending signals along wires works fine as long as you don't have to send signals too far.

When wires cannot be used, the signals are sent through the air by electromagnetic waves. The waves travel in straight lines from a sending antenna to a receiving antenna. If the distance is far enough that the waves have to travel around the curve of the earth, a series of antenna towers passes the signal along from one to another. If the distance is really, really far, satellites are often used to send the signals. The satellite basically works like an antenna up in space. Because it is so big, from both north to south and east to west, Canada was the first country in the world to use satellites to pass along communications signals. The size of the country also means that communications engineering is very important, so Canada has some of the best communications engineers in the world.

Some of the material in this article was found at http://schoolnet2.carleton.ca/english/math_sci/phys/electric-club/

WHAT COULD YOU DO AS A COMMUNCATIONS ENGINEER?

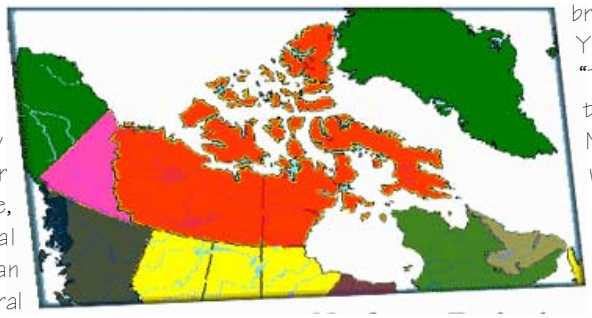
Storytelling and the passing of knowledge from one generation to the next is a very important part of Aboriginal tradition; it is how knowledge has survived for thousands of years. In many ways, modern ways of communicating are just new ways of telling stories and passing down knowledge. As a communications engineer you could set up a system where diabetics in your community could plug their glucose monitors into the phone lines and send the results directly to a doctor living hundreds or even thousands of miles away. You could maintain a community radio station or run an electronics store. You could help your band council decide if it wants community Internet access and how best to establish it. You could also contribute to education by establishing a local teleconferencing centre where students could take high school , college or university courses without leaving the community. By becoming a communications engineer you are helping the people in your community to tell their stories. Who knows? You might even set up the next Aboriginal broadcasting society. Read on…

TELEVISION NORTHERN CANADA ABORIGINAL BROADCASTING

Broadcasting uses communication technologies to send one television or radio signal to a lot of people at the same time. Across Canada there are a number of broadcasting stations run by and for Native people. The northern part of the country from the Yukon/Alaska border to the Atlantic coast of Labrador is served by Television Northern Canada (TVNC).

About twenty years ago, the only television shows people could get in the North were filmed and produced in the south. These shows might have been entertaining, but they certainly didn't represent what life is like for people living in the North. So, over time, a number of local, Aboriginal communications societies began producing programming "of social, cultural and linguistic importance to their own peoples." The first of these was Inuit Broadcasting (IBC) in the eastern Arctic, which was established in the early 80s. TVNC was formed in 1991 when IBC and a number of other societies, like Inuvialuit Communications Society and Northern Native Broadcasting, joined together to form a pan-Northern broadcasting service.

TVNC serves an area of 4.3 million square kilometers, a bit over one-third of Canada. It has an audience of about 100,000 people, more than half of whom are Aboriginal. These people come from 15 different Native language groups. Each of the languages, plus French and English, are represented during community discussion programs; northern legislative and political coverage; live and special events; and the activities of indigenous people of the circumpolar world."



TVNC's broadcast area
Source: http://www.tvnc.ca

TVNC's 100 hours of weekly programming which focuses primarily on "children's shows; accredited and general interest educational programming; cultural and currents affairs; documentary features; phone-in and

TVNC is distributed across the North via the Anik E-1 satellite, which was launched on September 26, 1991. Television uplink facilities - stations from where programs are sent up to the satellite for broadcast - are located in Iqaluit (NT), Yellowknife (NWT) and Whitehorse (YT). "The TVNC signal is re-broadcast over the air in 97 communities across Northern Canada and via cable vision where available."

Television broadcasters require communications engineers in order to maintain, modify and program both the equipment used to film shows – cameras, microphones, computers, VCRs – and the equipment used to broadcast shows – satellites dishes, antennas etc… They also require other types of engineers, like building and civil engineers, to maintain their buildings and facilities. There are many opportunities for engineers in the broadcast industry.

OUJÉ-BOUGOUMOU, CREE NATION

Oujé-Bougoumou is a Cree Nation of about 650 people located next to Lake Opemiska in the James bay Territory between the 49th and 50th parallels. Although the Oujé-Bougoumou people have lived in the region for as long as they can remember, their village is very new. The story of its development shows how tradition, engineering and economic development can be woven together for the benefit of the people. It is told by Chief Abel Bosum and other community members on the community's web site at **http://www.ouje.ca/**

History

The history of Oujé-Bougoumou is a heroic story of the determination of a small community of Cree aboriginal people to overcome the spread of mining and forestry industries, with their unending hunger for natural resources, into the furthest reaches of North America.

Our small group of people were content for centuries pursuing our traditional way of life based on hunting and fishing. The Oujé-Bougoumou people welcomed the early prospectors to our region and escorted them throughout the territory helping them to survive in the sometimes harsh climate. As mineral deposits were identified in increased quantities more people entered the territory. Mining camps gave way to settlements which eventually gave way to towns. As the mining activities increased the Oujé-Bougoumou people came to be seen as an obstacle to industrial growth.

We were forced to relocate our villages time after time to make way for new mines. Between 1920 and 1970, the Oujé-Bougoumou people were forced to relocate no fewer than seven times. We witnessed our villages repeatedly destroyed. And we were left, scattered, to live in deplorable conditions as "squatters" on the land we had occupied since time immemorial.

But the Oujé-Bougoumou people refused to disappear. We decided to make our stand and take our rightful place in the region as the original inhabitants and the centuries-old stewards of the land. After a lengthy and protracted political struggle and, against all odds, Oujé-Bougoumou won recognition by the Government of Canada and the Province of Quebec of our right to live as a community. We began to re-build our village and restore the community life which had been shattered. Our courage and our commitment throughout the years was sustained by our yearning to live together again as a community.

That determination has now been translated into the building of a new village. We seek to live in peaceful co-existence with other peoples of the region. In Oujé-Bougoumou there has been unleashed an enormous creativity which has resulted in the establishment of a model aboriginal village.

We hope that Oujé-Bougoumou can be an inspiration for aboriginal people everywhere to continue their struggles to build communities where their people can grow and thrive.

Vision

When we began to seriously plan our new village, we started with a vision.

The essential thrust of that vision was to re-create the well-being of our traditional way of life to the fullest extent in the context of modern facilities and contemporary institutions.

In our traditional way of life there were no formal distinctions between work and play, between teaching and learning, between the richness of family ties and the establishment of specific roles for people, nor for that matter between healing and daily life. Daily life itself was infused with elements of learning, healing, play and a deeply rich network of social relationships.

Our new village would have to be a source of learning, a source of spiritual renewal, a source of physical and economic sustenance, and a source for the healing of many wounds, both past and present. And all this would be embedded in the context of our traditional Cree ways of relating to one another.

Throughout our planning and construction the community members have participated at every level of decision-making and direction-setting, from the expression of hopes, dreams and visions, to decisions on more technical matters involving the direction of basic construction issues.

Successful aboriginal development requires that we always keep in mind that the

Creator gave us hearts to have vision, minds to devise solutions to problems and hands to build our communities. It was on the basis of this set of beliefs that we undertook a unique approach to the village architecture, the design of our innovative housing program, the installation of an appropriate alternative energy system and devised our current economic development plans.

A Sustainable Community

The Oujé-Bougoumou community hopes that in our own small way, by demonstrating how it is possible to plan our village so that the various components are integrated and mutually reinforcing for the long-term benefit of the community, we are making a contribution to current thinking about "sustainable communities" and are providing practical expression of sustainable development.

From a somewhat larger perspective, it may be precisely here, in the conceptualizing of how communities can be constructed on a sustainable basis, that aboriginal people have a contribution to make to the unfolding of world history. What the Oujé-Bougoumou experience is giving us all is a glimpse of the possible.

Major Objectives

In planning the new village, we defined three major objectives:

Our village had to be constructed in harmony with our environment and with the traditional Cree philosophy of conservation. Our traditional land-based way of life requires that any development be undertaken in a way that is respectful of, and in harmony with, the environment. Our reliance on the land and its resources continues to foster practices which ensure that the land and resources will be available for those who come after us.

Our village had to provide for the long-term financial requirements of our people. It would not do simply to construct something which could quickly become a "welfare enclave".

Our village had to reflect Cree culture in its physical appearance and in its functions. We were unwilling to simply import a non-Cree version of a village to our territory. The village had to be truly ours in every sense of the word.

In their totality, these planning principles reflect the philosophical basis of our traditional way of life. In recent years, this philosophy has come to be referred to more widely as "sustainable development".

We realized quite early on that if we were successful in realizing our vision, then our entire village would become a kind of healing center in which healing is viewed as much more than simply the remedying of physical ailments. If we could structure our new village and our new environment in such a way as to meet all of the varied needs of our people then the result would be a place which produced healthy, secure, confident and optimistic people who felt good about themselves and able to take on any challenges which may confront us.

Design and Architecture

In order to ensure that the physical appearance of our new village reflected our own cultural heritage we engaged the services of a renowned aboriginal architect, Mr. Douglas Cardinal, to design the major public institutions in the new village. Mr. Cardinal designed Canada's national museum, the Museum of Civilization and is now designing the National Museum of the American Indian for the Smithsonian Institution in Washington.

Because of his aboriginal background we did not need to go through the process of training the outside professional to work with aboriginal people. He understood this instinctively. He did not attempt to impose his own vision on us but worked intensively to have us express the visions within us which would become the basis for the village architecture. The result has been the establishment of a village which not only can our people relate to, but is of such beauty that it challenges us to live up to the ideals which are expressed in the architecture.

The community members chose the site, on the shores of Lake Opemiska, close to all the traditional trap lines. They also sat down with architect Douglas Cardinal and explained the science underlying the traditional Cree dwelling, the astchiiugamikw. The idea for many of the community buildings in Oujé-Bougoumou was based upon the structure of the astchiiugamikw. The dwelling is constructed of a wooden frame in teepee-like fashion, and covered with a combination of moss and sand. The ceiling reaches the earth. A partially dug-out interior surrounds a stone fire pit. Sweet-smelling spruce boughs keep the floor fresh and soft underfoot. The interior is bathed in natural light from a fire hole at its apex.

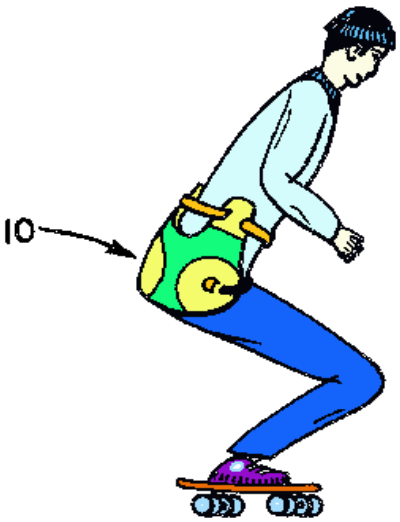
Cardinal took the concept of ceilings that go from the sky to the earth to develop preliminary sketches. He and his staff then fashioned modern buildings where the roof is the dominant feature, and where light and open spaces define the interiors. This process was used to shape the headquarters office, the school, the healing center, day-care center, elder's home, and business centre - each of which was treated as a village within the village. There are no steps to the front doors. Every room and office has a big window. There are open beams and skylights in all the homes, just like in the houses of their ancestors. The doors of the homes face east, where the sun rises, as the elders demanded. Community youths suggested taller two-story buildings integrating traditional and contemporary structures. The results demonstrate a successful community-driven process, as well as the gifts of Douglas Cardinal.

The village design is circular, with the shaptuwan (traditional meeting place for feasts) central and at the top of the hill. The inner two rings are lined with communtiy buildings, reflecting the culture of sharing.

FUN FACTS AND THINGS TO THINK ABOUT

Sometimes the strangest things get patented!

Inventors get patents to ensure they own the rights to their own creations. The accompanying picture is of a real invention developed by someone in the United Sates in the 1970s. That person received USA patent 4,151,613 for "bulletproof buttocks". The contraption is made from resilient, shock absorbing plastic and foam and is secured at the waist with an adjustable belt. It isn't actually designed to prevent skateboarders from getting shot in the butt, rather it's supposed to protect their rear ends and hips from damage during a fall – kind of a bicycle helmet for the other end.



Source: Totally Absurd
http://www.totallyabsurd.com/bulletproofbuttocks

Did you know …

… some microchips are so small they can fit through the eye of a needle?

… a single fibre optic cable thinner than the dots at the beginning of this line can carry 2000 two-way conversations at the same time?

Source: Silicon Graphics
http://www.sgi.com/Fun/free/gallery.html

This picture was made by an artist using a computer. Artists and engineers are working together more and more because new technologies, like computers, allow people to communicate and create in many different ways.

The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them.

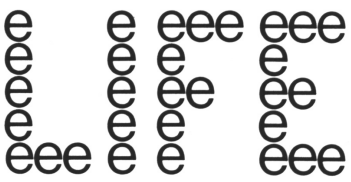
-- Sir William Bragg

Meet Duncan Cree

Duncan Cree is a Mohawk from Kanesatake, a native community north-east of Montreal. He is an undergraduate student in Mechanical Engineering at Concordia University who will graduate next Spring. For the past two summers, Duncan has worked at Pratt & Whitney Canada, a company which designs and manufactures aircraft engines. This year he designed a hydraulic press which will be used in some of the engines. Duncan says he thought engineering "would be easier than it actually is. But if you work hard enough it's rewarding." And, he adds, part of the reward is knowing that he has worked for something that will last a lifetime, "This knowledge that you carry can never be taken away from you."

Puzzles and Games

1.



Just lay back and put your feet up.

Have you heard the expression "A picture is worth a thousand words"? It means that sometimes pictures tell us a lot in a very efficient way. For this reason engineers use pictures to communcate all the time.

Each of the pictures shown represents a phrase. Can you figure out what they are?

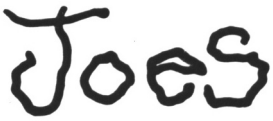
2.

You're never alone - at least when it's sunny outside.

3.

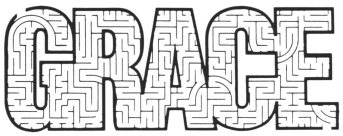
You might have this problem when you have a paper to do.

4.



Really good - for lunch or dinner.

5.



If you figure this one out it will be aMAZEing!

Follow this and you're pretty sure not to go wrong.

Answers:1. Life of ease; 2. Me and my shadow; 3. Writer's block; 4. Sloppy Joes; 5. Amazing Grace; 6. Rule of thumb

Source: *The Big Book of Games* Workman Publishing, New York, 1984

All About Us

The Native Access to Engineering Program at Concordia University is a joint project of the Faculty of Engineering and Computer Science and l'Ordre des ingénieurs du Québec. It has been running since 1993 with the goal of introducing young Aboriginal people and their teachers to engineering and its connection to economic development. The project's ultimate goal is to increase the representation of Aboriginal people's among the ranks of professional engineers in Canada.

You can reach us at

Native Access to Engineering
Engineering and Computer Science
Concordia University
1455 de Maisonneuve West, LB 1001
Montreal, Quebec H3G 1M8
Tel: (514) 848-7847
Fax: (514) 848-4509
Email: Native-Access@encs.concordia.ca