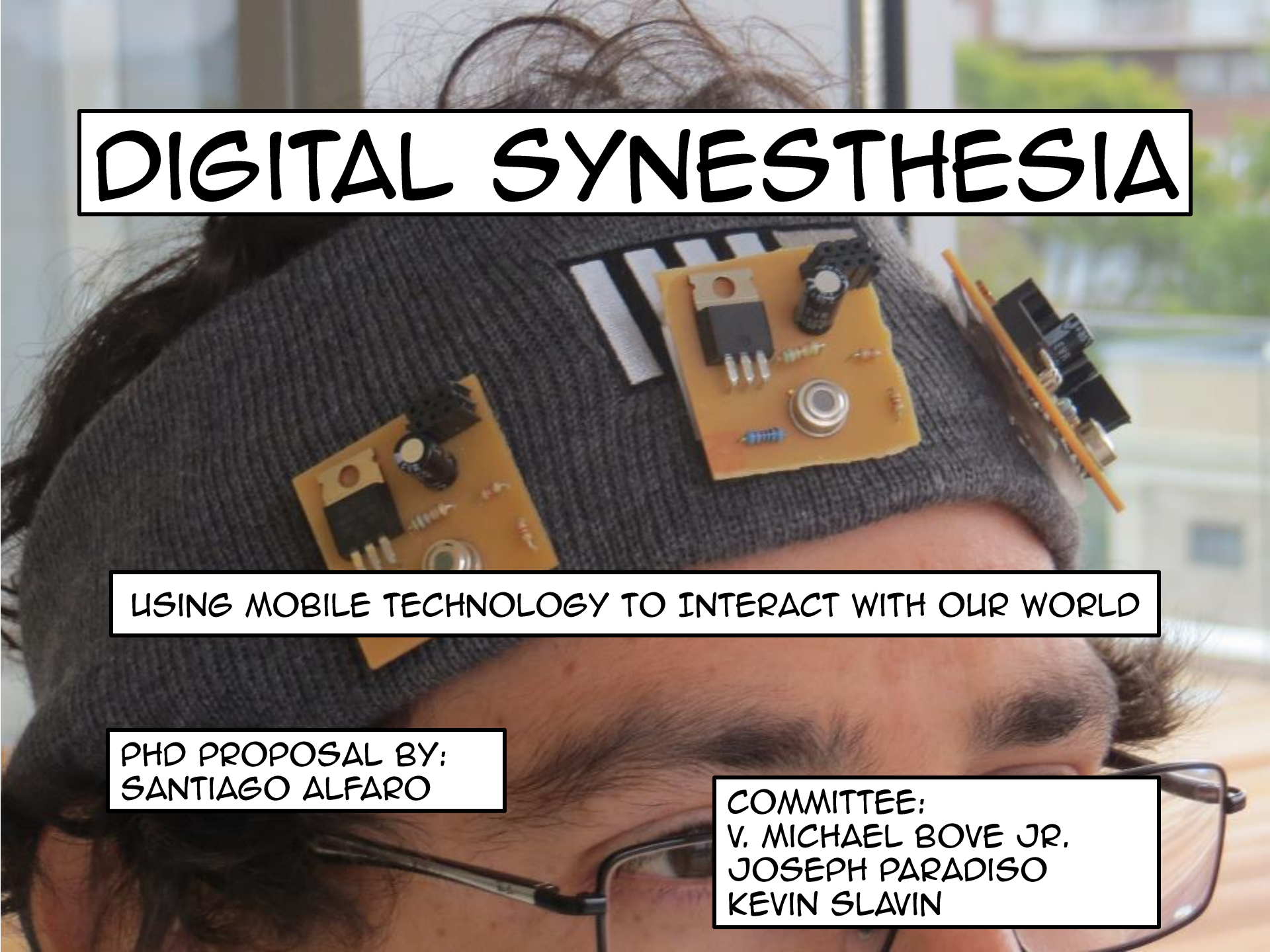
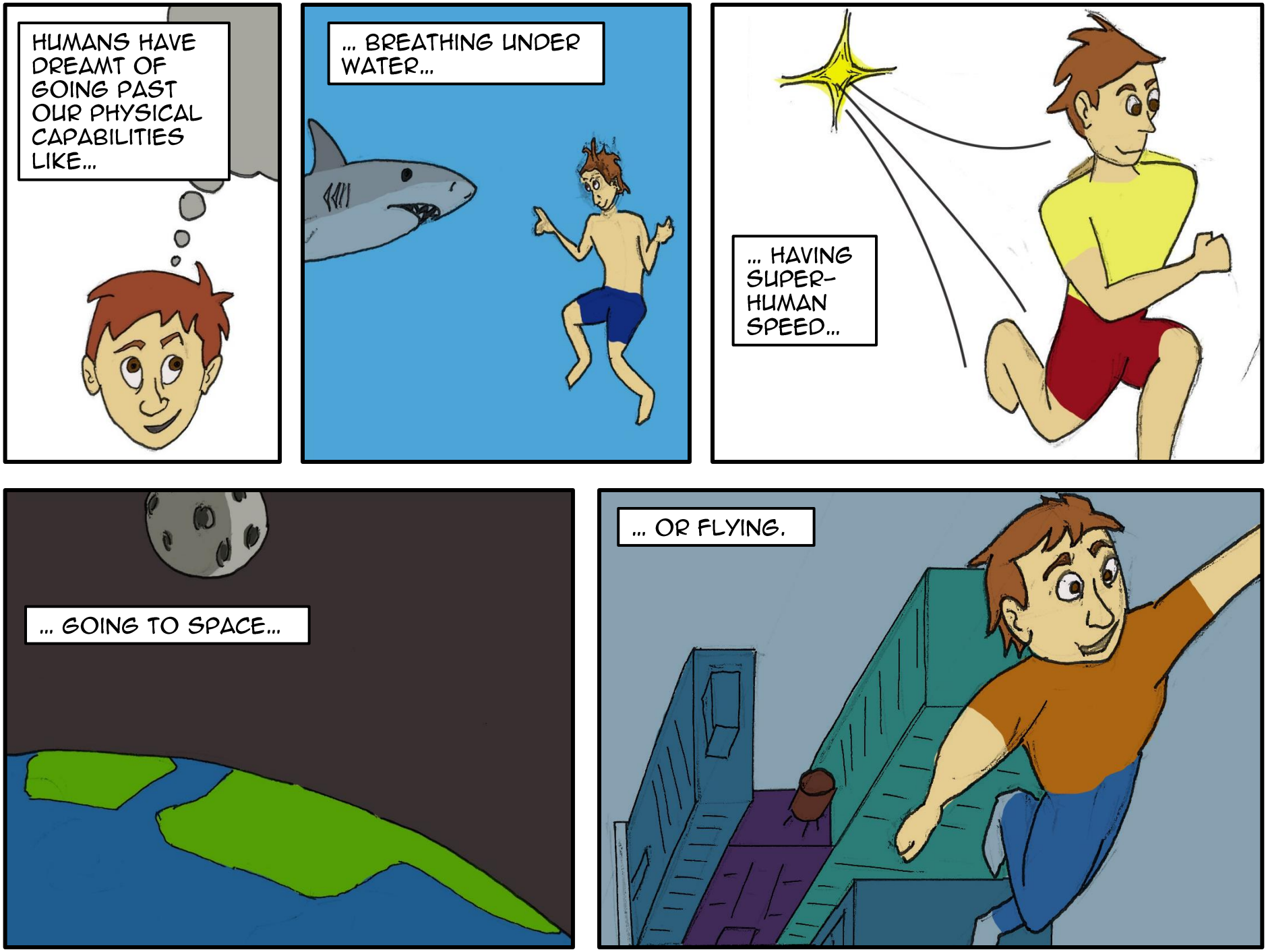


DIGITAL SYNESTHESIA

USING MOBILE TECHNOLOGY TO INTERACT WITH OUR WORLD

PHD PROPOSAL BY:
SANTIAGO ALFARO

COMMITTEE:
V. MICHAEL BOVE JR.
JOSEPH PARADISO
KEVIN SLAVIN


HUMANS HAVE DREAMT OF GOING PAST OUR PHYSICAL CAPABILITIES LIKE...
... BREATHING UNDER WATER...
... HAVING SUPER-HUMAN SPEED...
... GOING TO SPACE...
... OR FLYING.

OTHER DREAMS ARE ABOUT OUR SENSES...

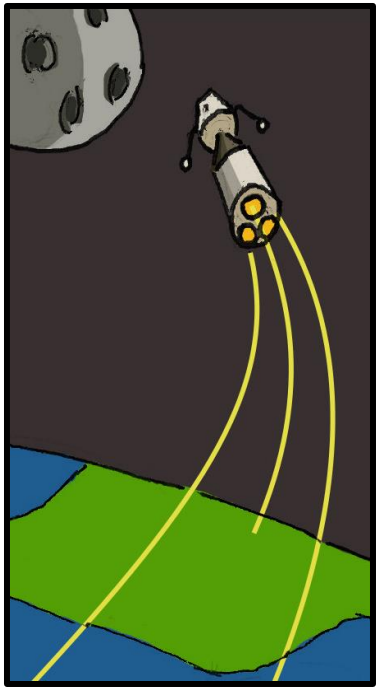
OTHER DREAMS ARE ABOUT OUR SENSES...

OTHER DREAMS ARE ABOUT OUR SENSES...

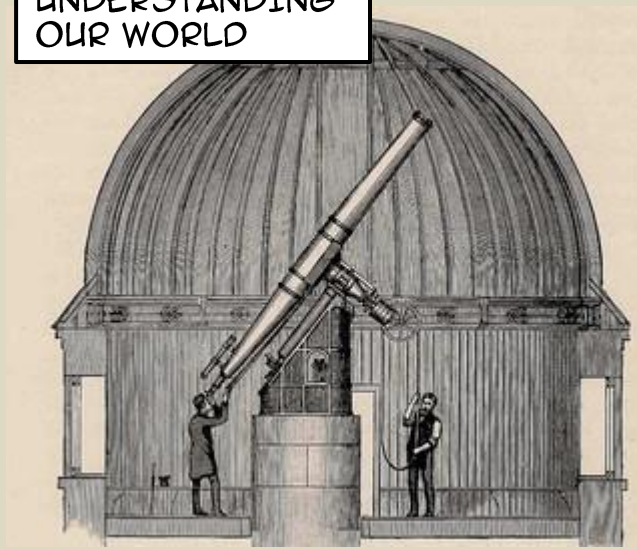
OTHER DREAMS ARE ABOUT OUR SENSES...

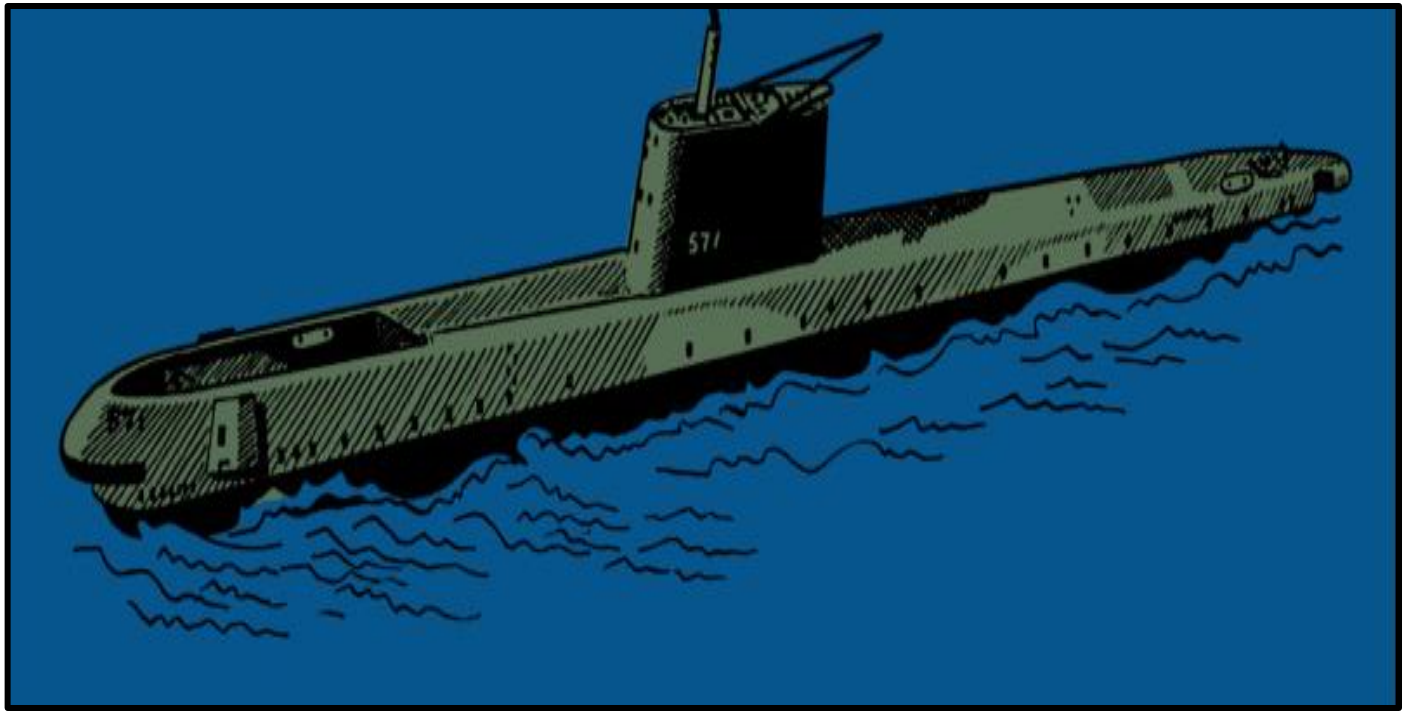
WE HAVE REACHED SOME DREAMS

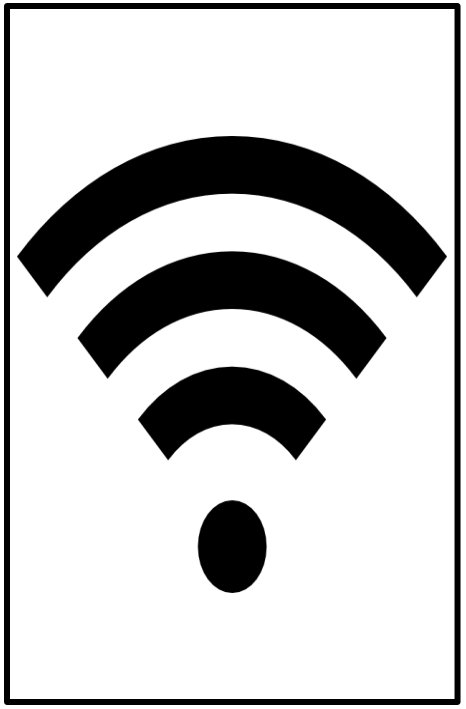
WITH TECHNOLOGY

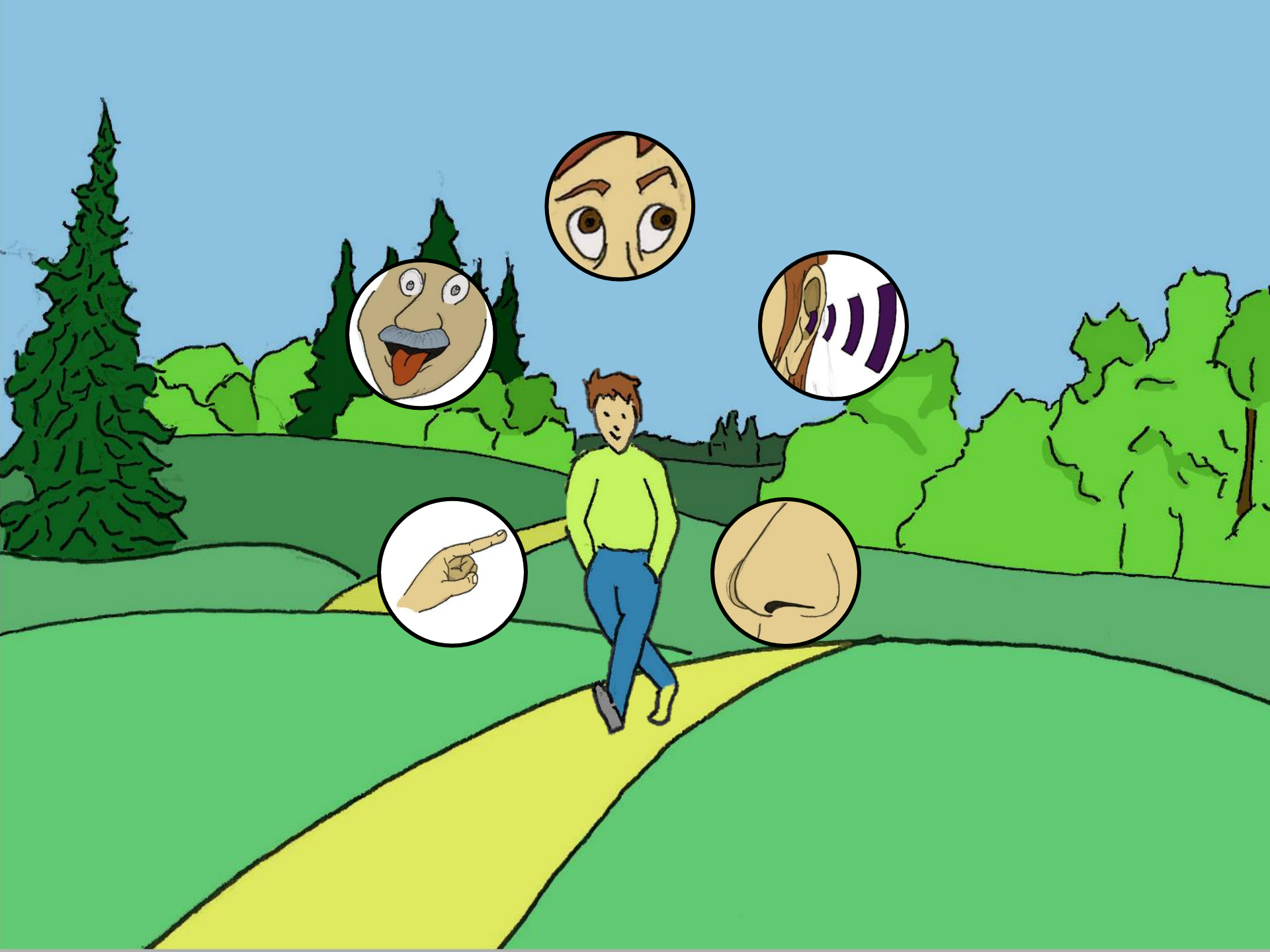


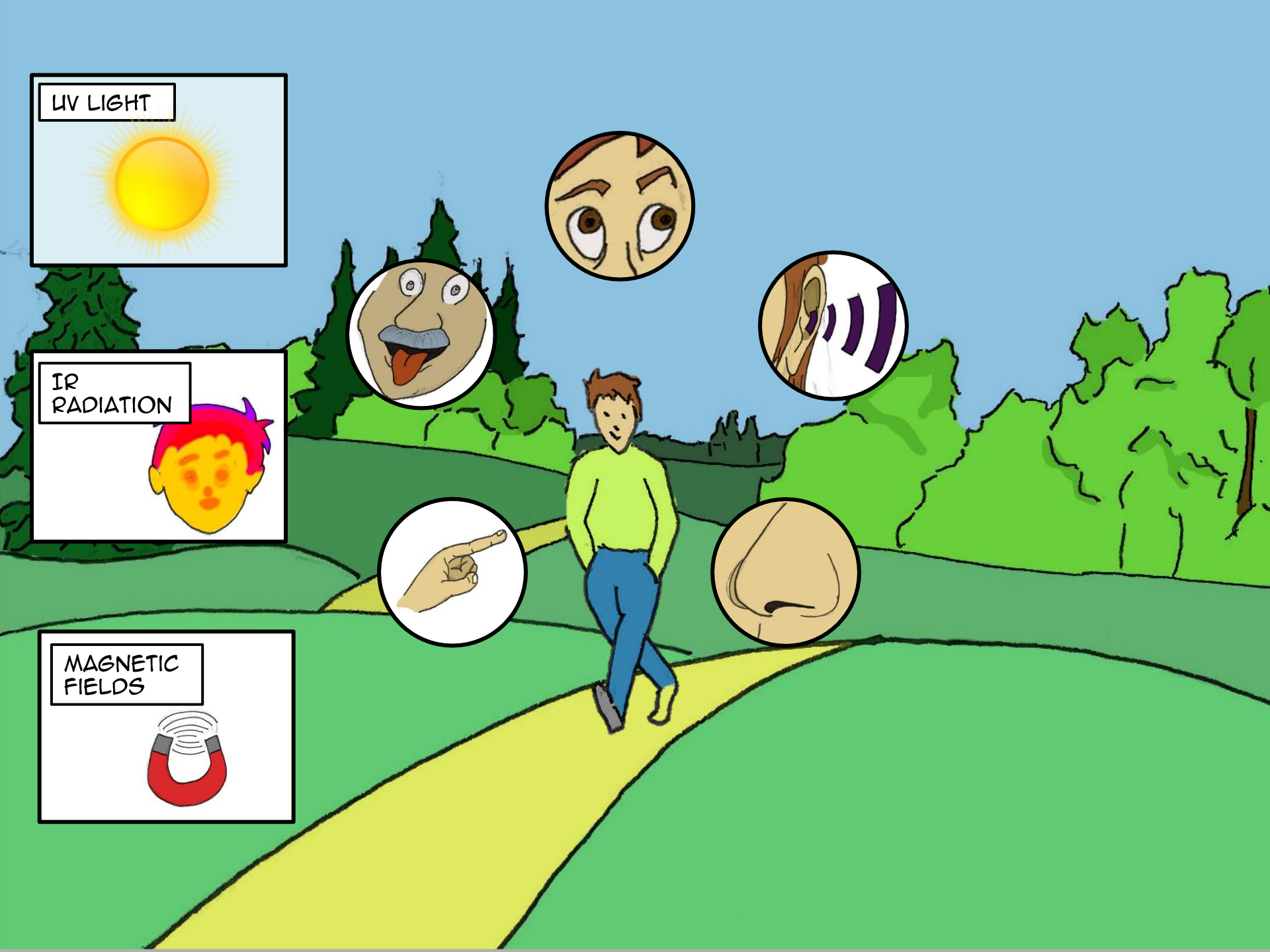
AND BY UNDERSTANDING OUR WORLD

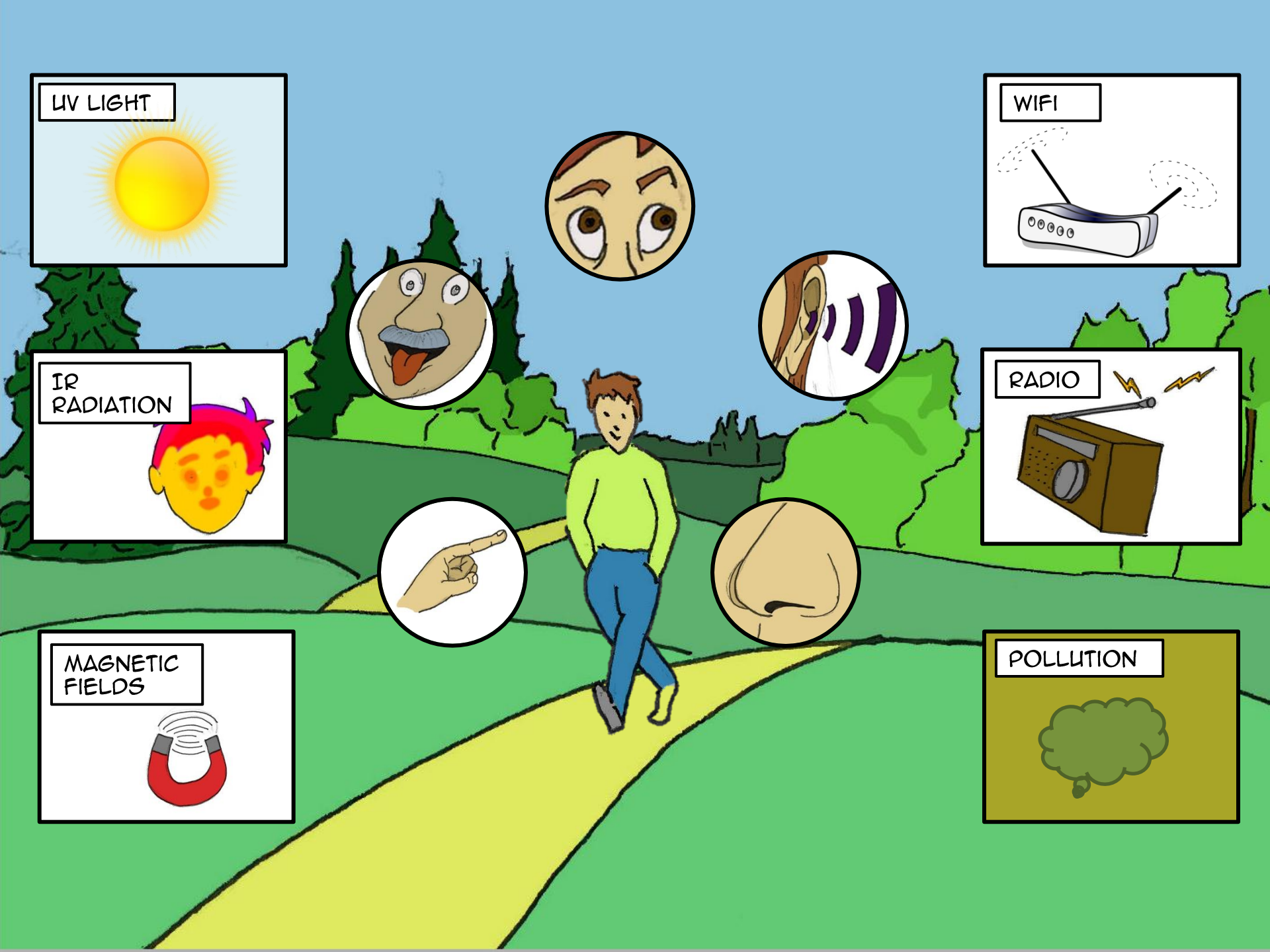


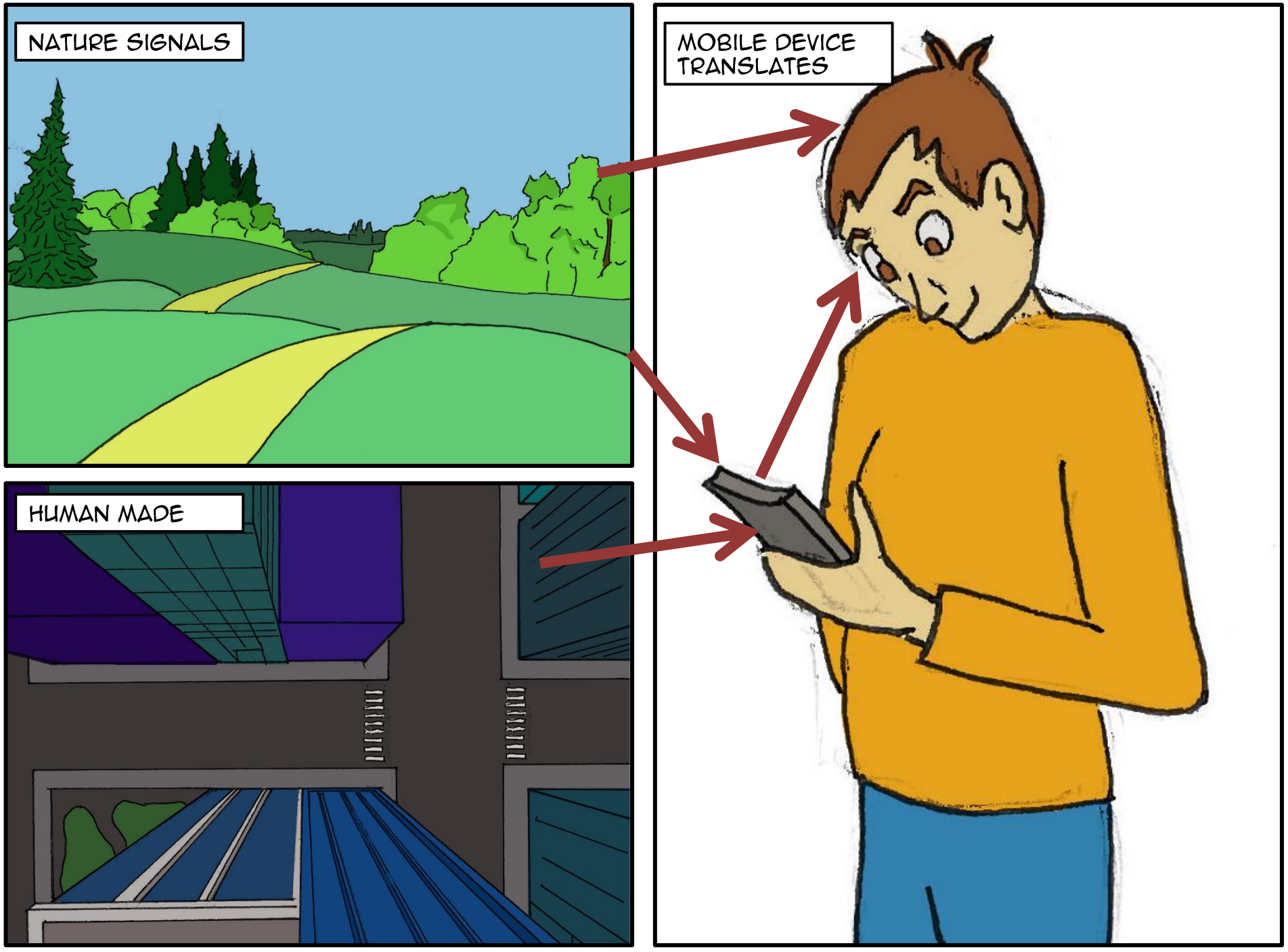


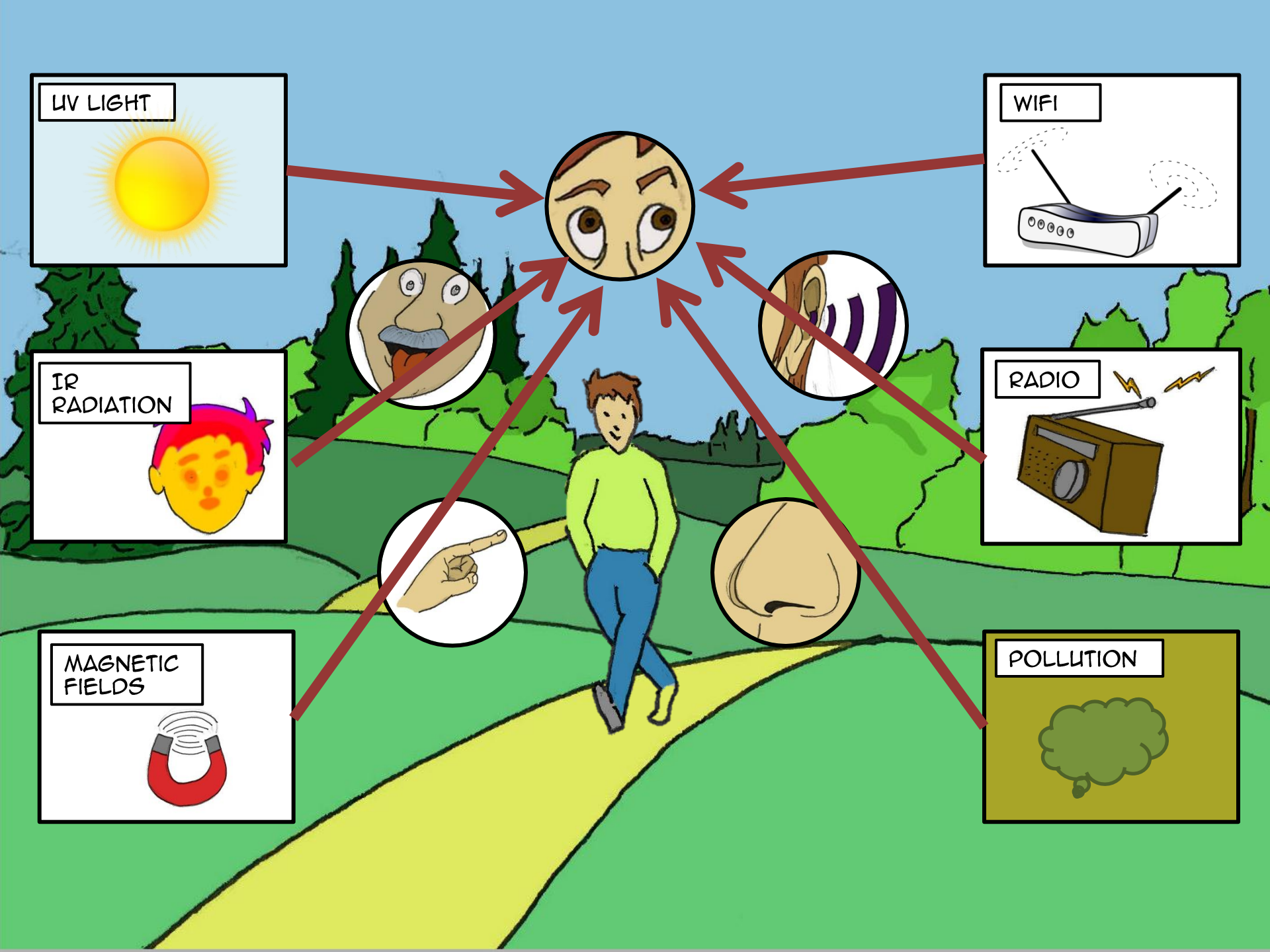


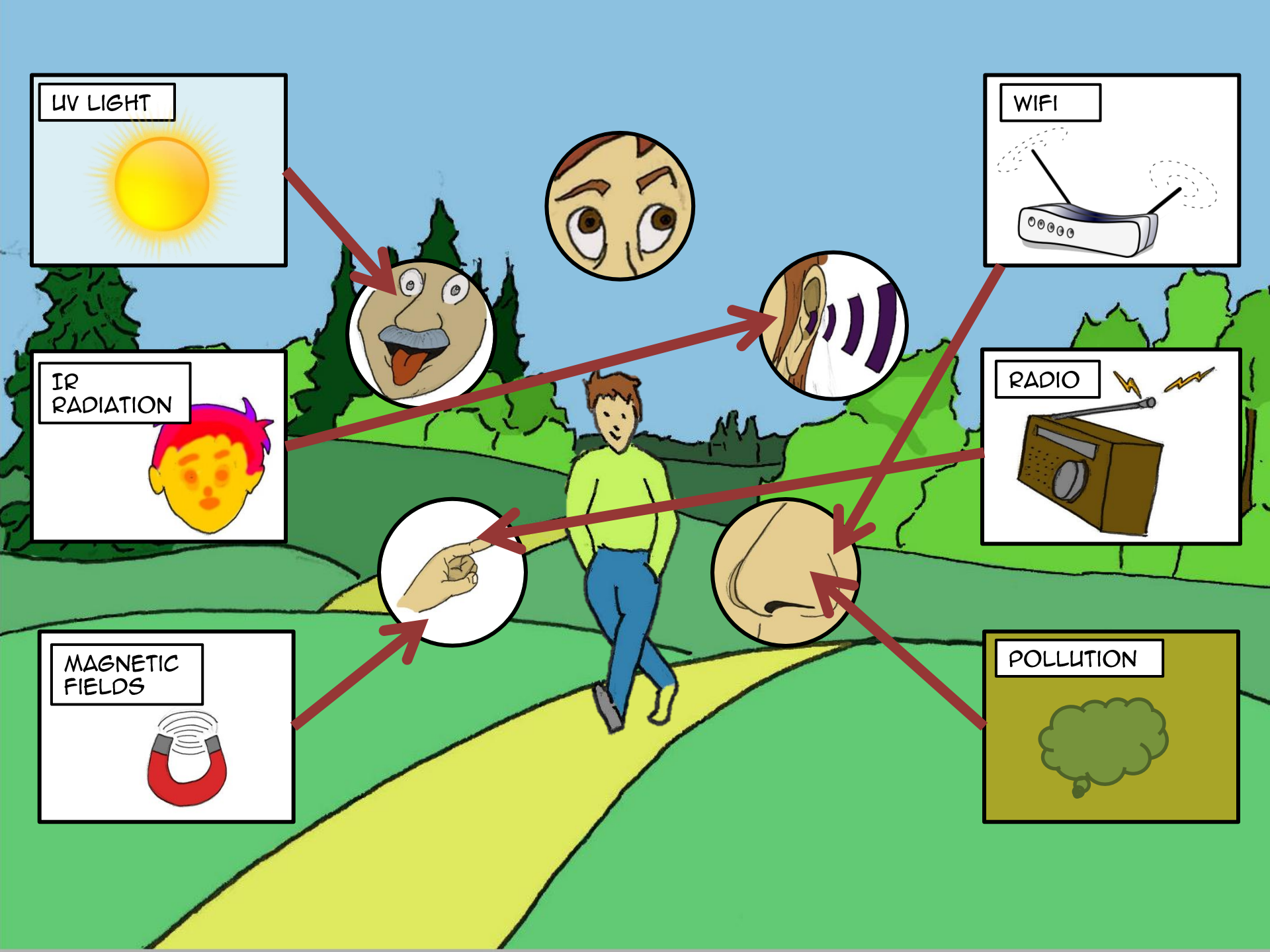


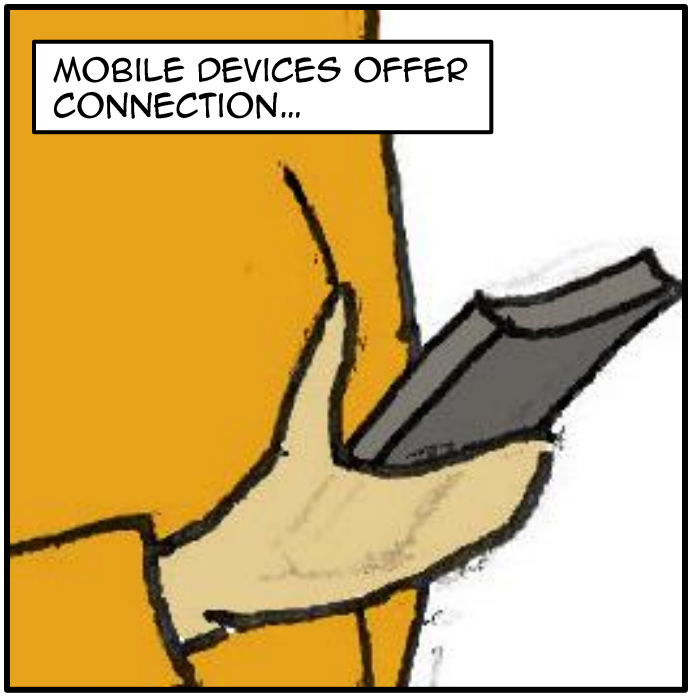

UV LIGHT
IR RADIATION
MAGNETIC FIELDS

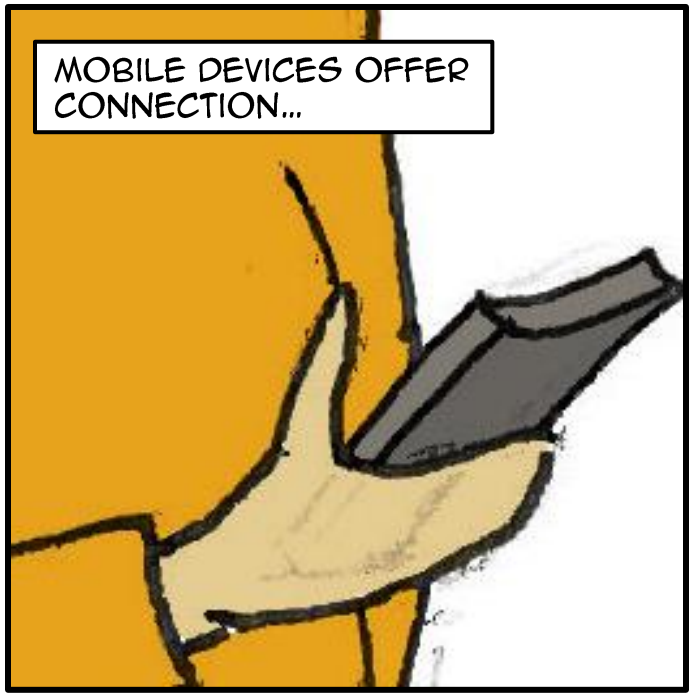

UV LIGHT
WIFI
IR RADIATION
RADIO
MAGNETIC FIELDS
POLLUTION


NATURE SIGNALS
HUMAN MADE
MOBILE DEVICE TRANSLATES

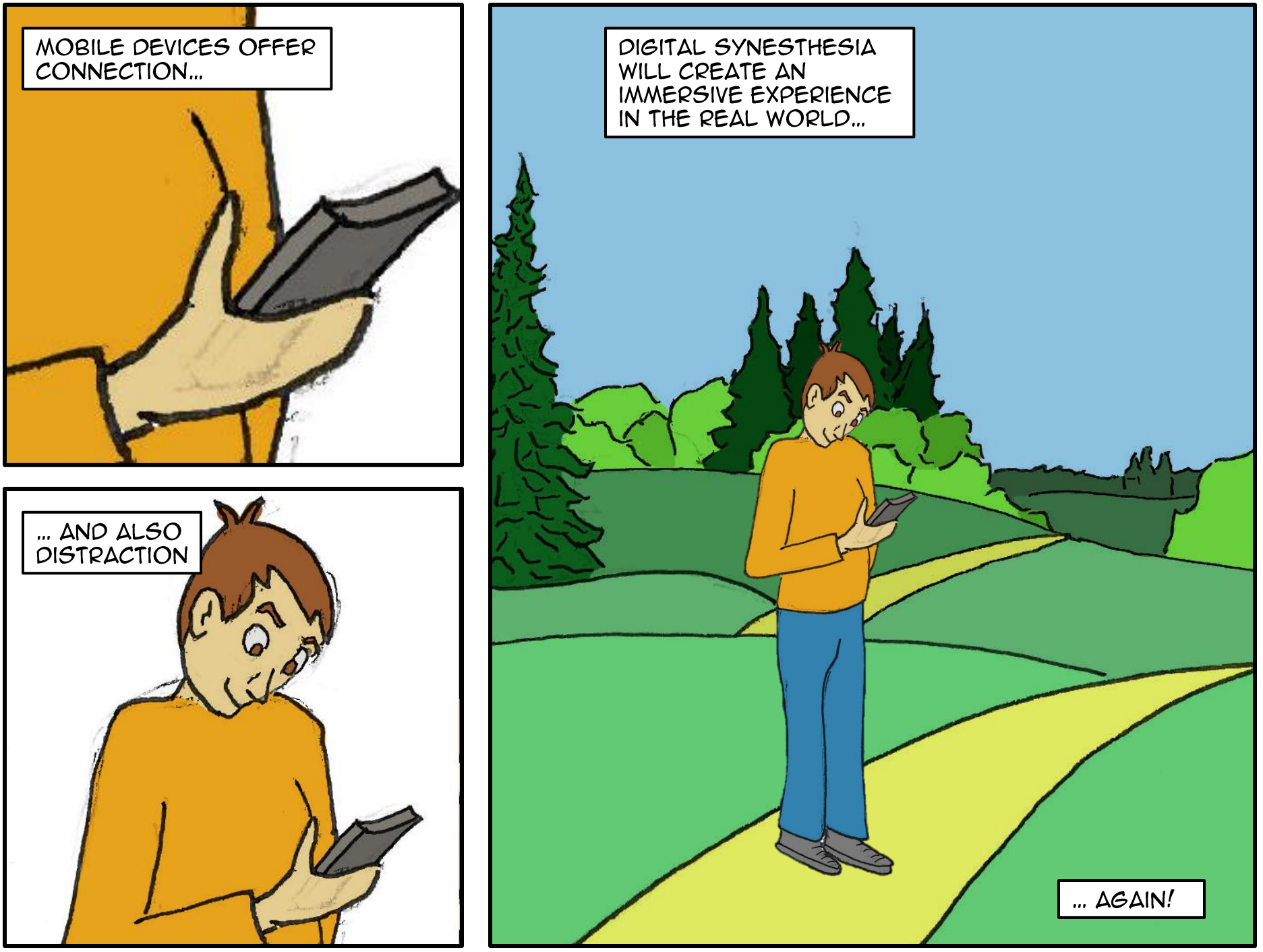

UV LIGHT
WIFI
IR RADIATION
RADIO
MAGNETIC FIELDS
POLLUTION


UV LIGHT
WIFI
IR RADIATION
RADIO
MAGNETIC FIELDS
POLLUTION


MOBILE DEVICES OFFER CONNECTION...


MOBILE DEVICES OFFER CONNECTION...


... AND ALSO DISTRACTION

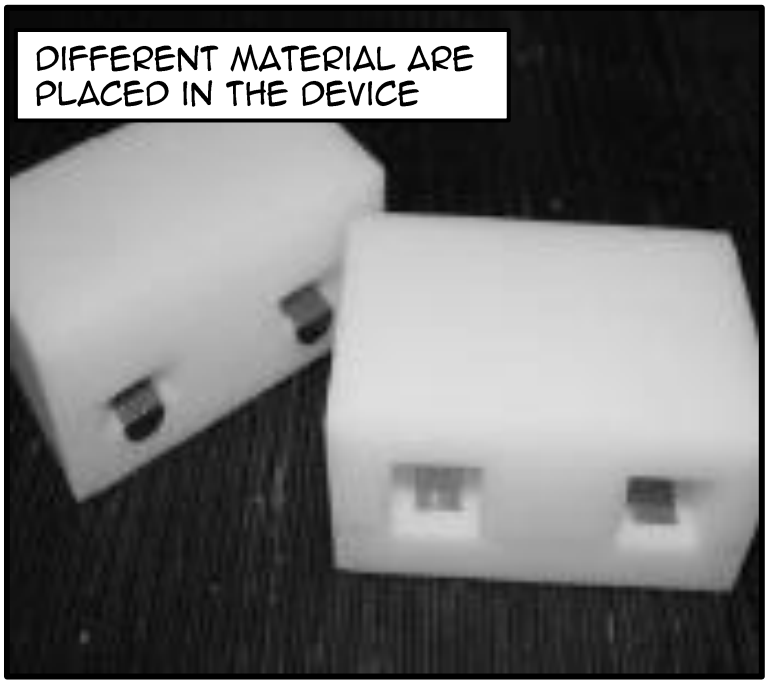

MOBILE DEVICES OFFER CONNECTION...
... AND ALSO DISTRACTION
DIGITAL SYNESTHESIA WILL CREATE AN IMMERSIVE EXPERIENCE IN THE REAL WORLD...
... AGAIN!

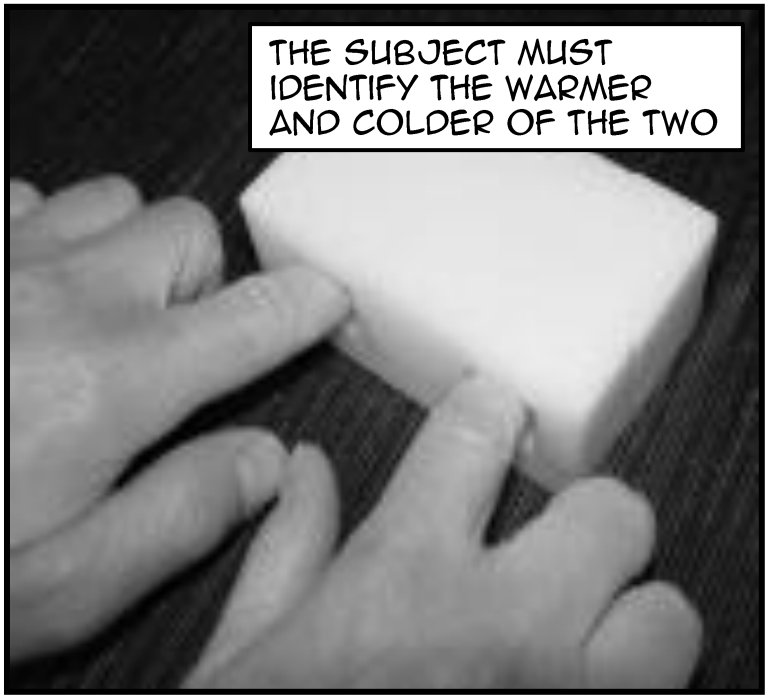
BACKGROUND:

- THERMAL INTERFACES
- VIBRATION INTERFACES
- MOBILE DEVICE INTERFACES
- SENSORY SUBSTITUTION
- NEW SENSORY EXPERIENCES

BACKGROUND:

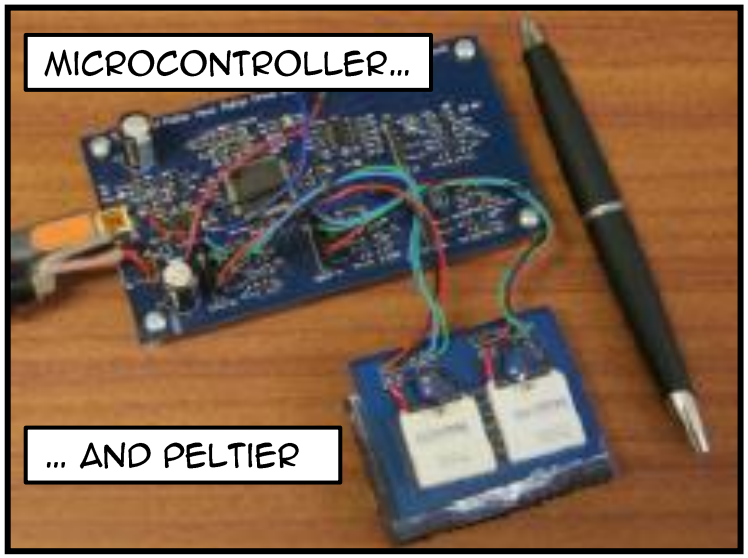
THERMAL INTERFACES





DEVELOPMENT OF THERMAL DISPLAYS AND UNDERSTANDING THE NATURE OF THERMAL CUES.

"MATERIAL DISCRIMINATION AND THERMAL PERCEPTION"
L. A. JONES AND M. BERRIS



USERS DETECT HOT AND COLD STIMULI PRESENTED TO THE FINGERTIPS, THE PALM AND THE ARM

TWO STUDIES. ONE STATIC INDOOR AND ONE MOBILE

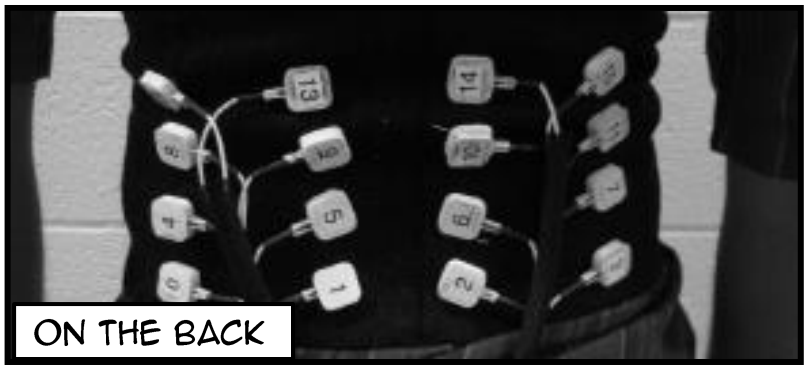
THE EXPERIMENT WAS REPEATED WITH THE SUBJECTS WALKING AROUND

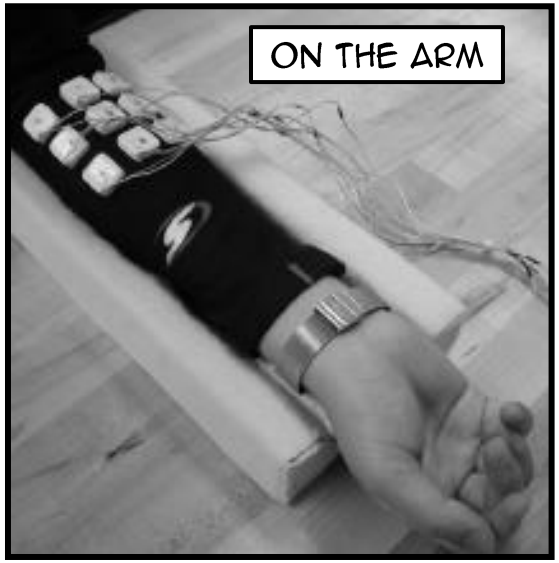
"SOME LIKE IT HOT ? THERMAL FEEDBACK FOR MOBILE DEVICES"
G. WILSON, M. HALVEY, S. A. BREWSTER, AND S. A. HUGHES,

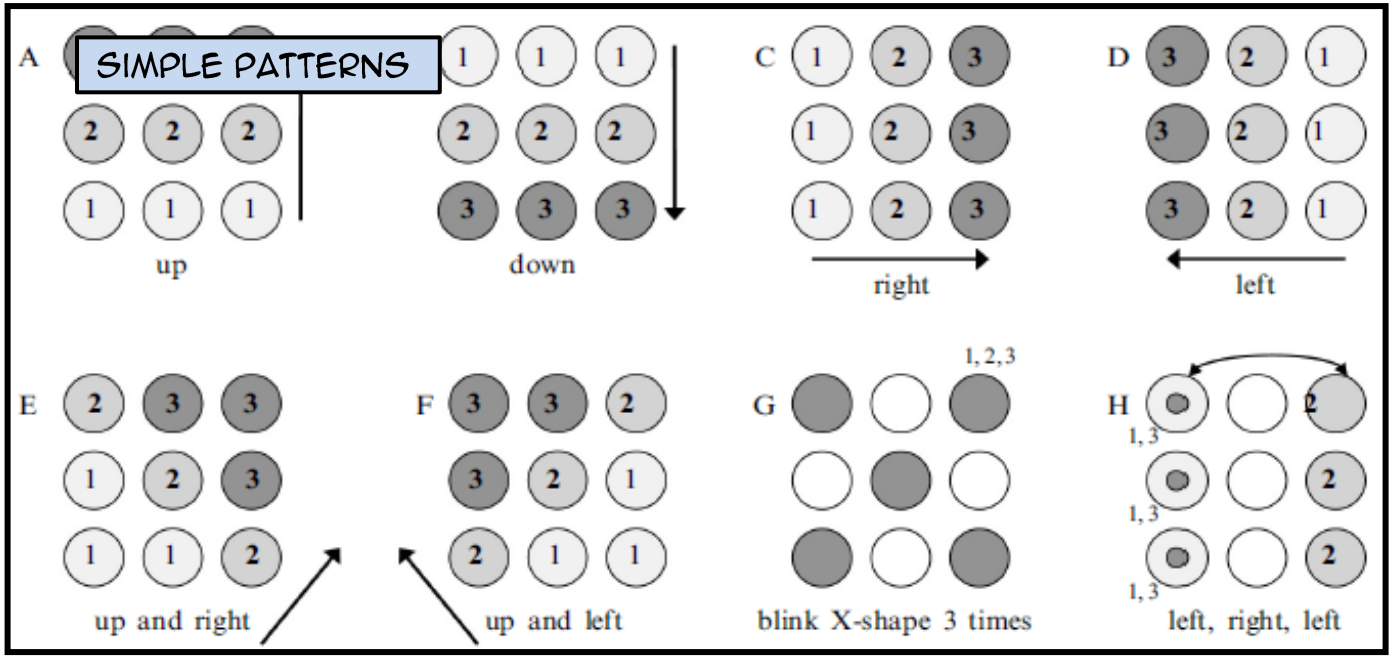
BACKGROUND:

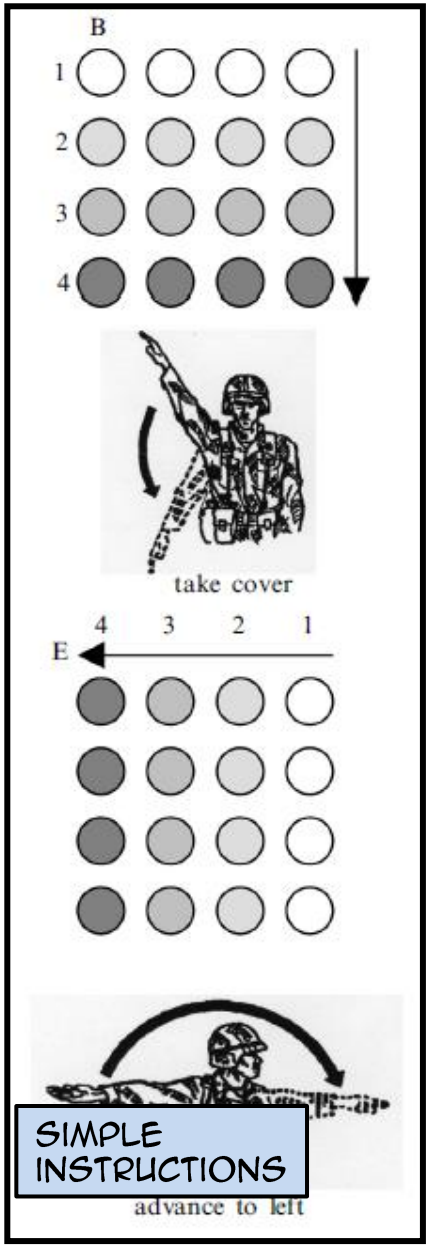
VIBRATION INTERFACES

HOW A TACTILE DISPLAY CAN COMMUNICATE SIMPLE INSTRUCTIONS AND COMMANDS



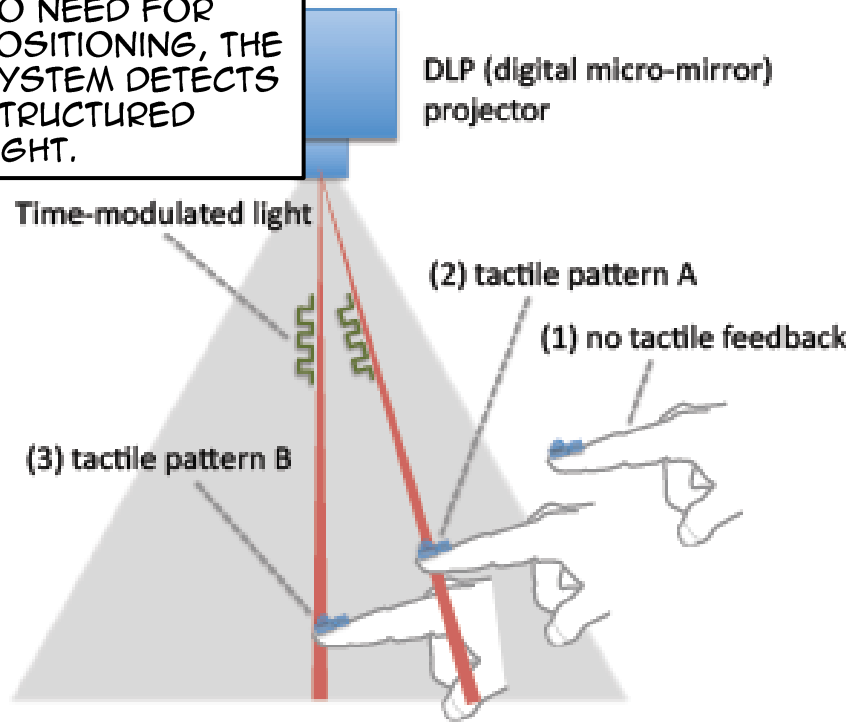




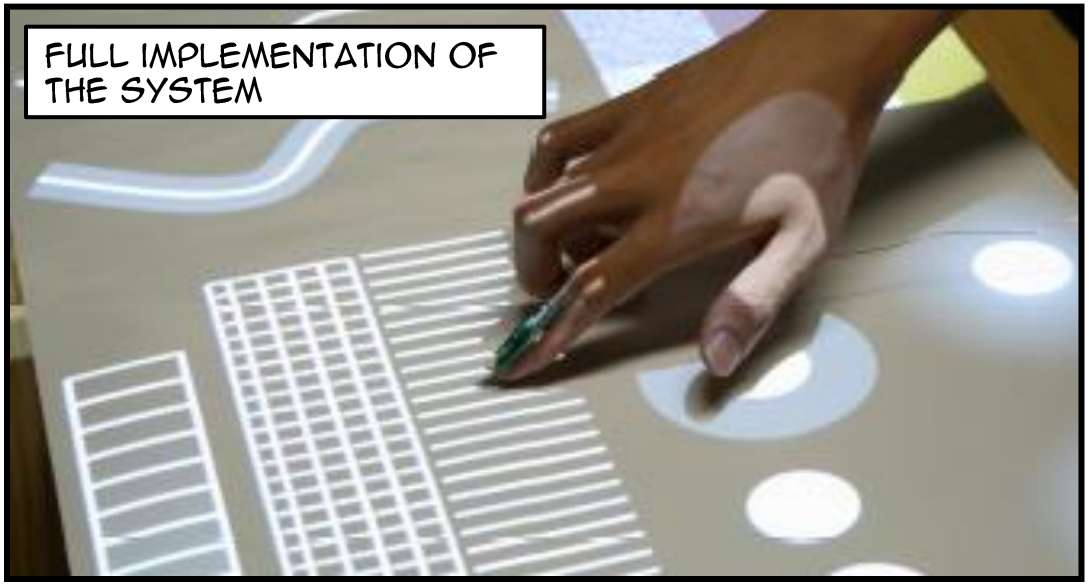


"VIBROTACTILE PATTERN RECOGNITION ON THE ARM AND BACK"
L. A. JONES, J. KUNKEL, AND E. PIATESKI

NO NEED FOR POSITIONING, THE SYSTEM DETECTS STRUCTURED LIGHT.



FULL IMPLEMENTATION OF THE SYSTEM



OPTICAL-HAPTIC SUBSTITUTION

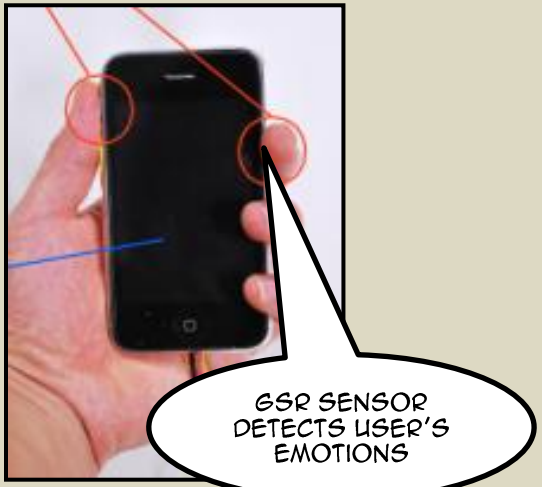
"SENSEABLERAYS: OPTO-HAPTIC SUBSTITUTION FOR TOUCH-ENHANCED INTERACTIVE SPACES"
J. REKIMOTO

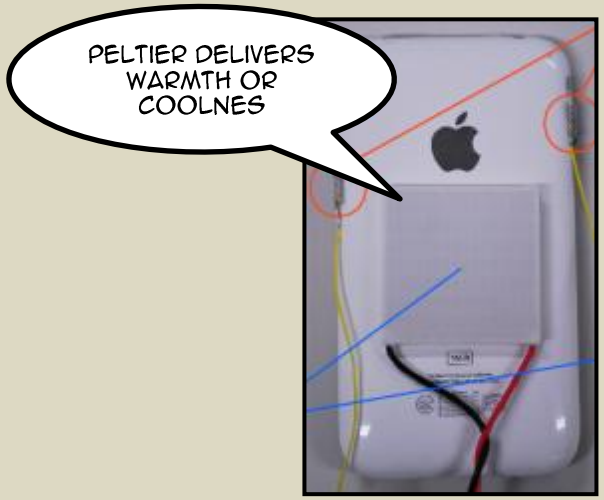
BACKGROUND:

MOBILE DEVICE INTERFACES

AFFECTPHONE

DETECTS A USER'S EMOTIONAL STATE USING GSR, AND CONVEYS THIS STATE VIA CHANGES IN THE TEMPERATURE OF THE BACK PANEL OF THE OTHER HANDSET

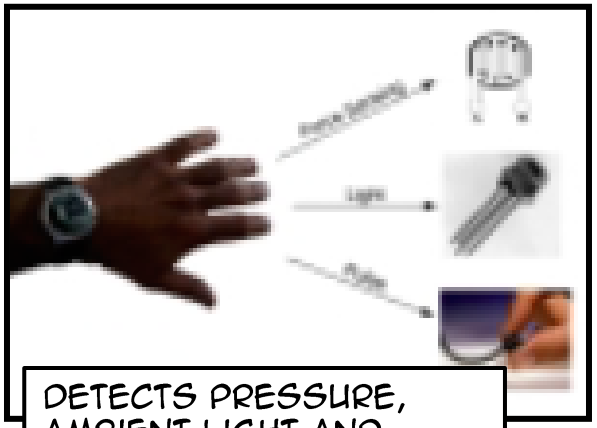




"AFFECTPHONE: A HANDSET DEVICE TO PRESENT USER'S EMOTIONAL STATE WITH WARMTH/COOLNESS"
K. IWASAKI, T. MIYAKI, AND J. REKIMOTO

CONNEXUS

AIMS TO DETECT VARIOUS CONDITIONS AT A TIME AND TRANSMIT THEM IN DIFFERENT WAYS



DETECTS PRESSURE, AMBIENT LIGHT AND HEARTBEAT

GIVES HEAT, LIGHT AND VIBRATION

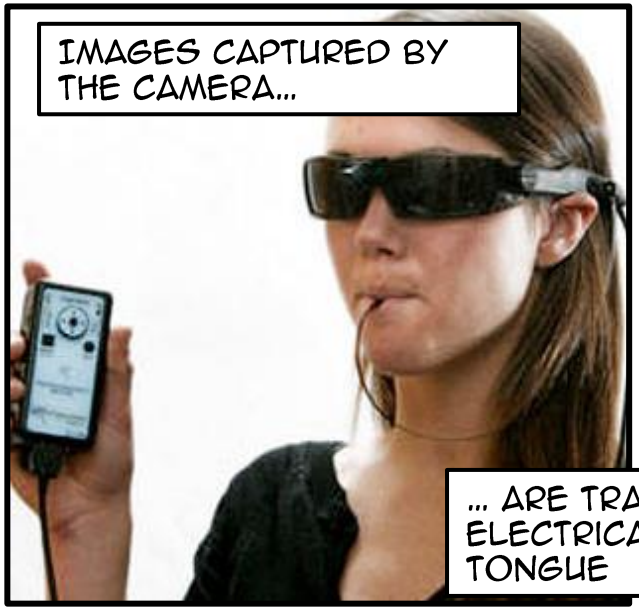
""CONNEXUS: A COMMUNAL INTERFACE"
E. PAULOS

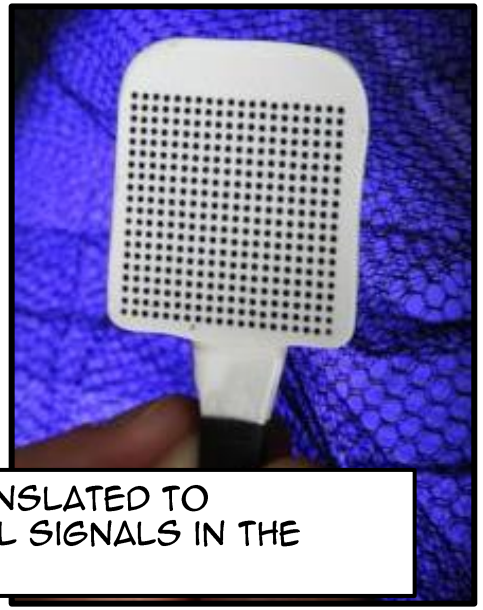
BACKGROUND:

SENSORY SUBSTITUTION

BRAINPORT AND EYEBORG

"BRAINPORT: AN ALTERNATIVE INPUT TO THE BRAIN"
Y. DANILOV AND M. TYLER



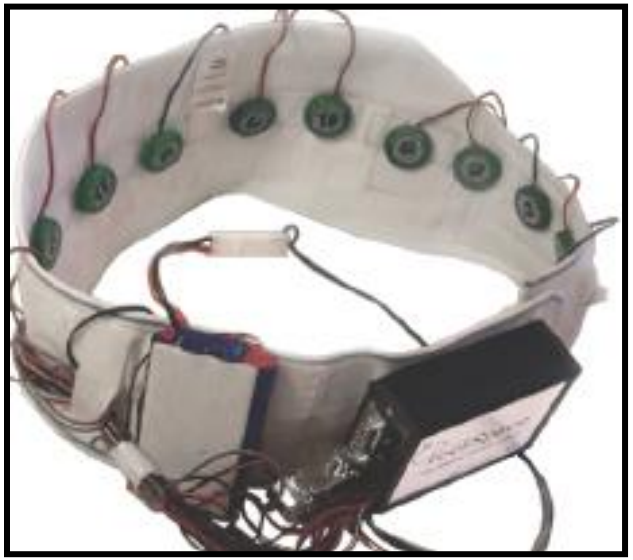


"EYEBORG"
NEIL HARBISSON

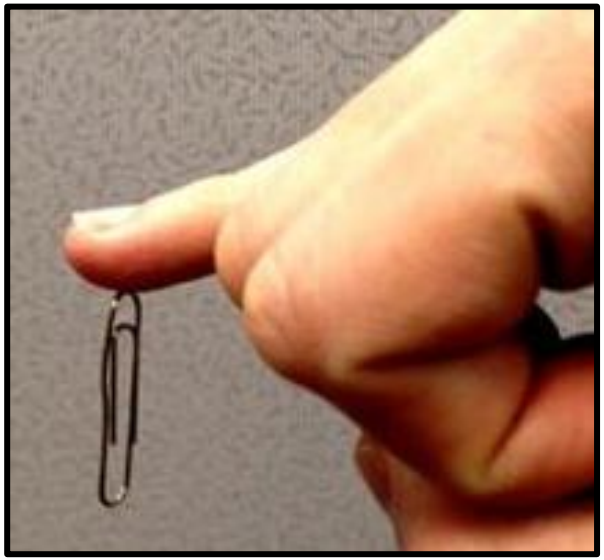
BACKGROUND:

NEW SENSES

FEELSPACE BELT, BODY HACKING AND MOMO



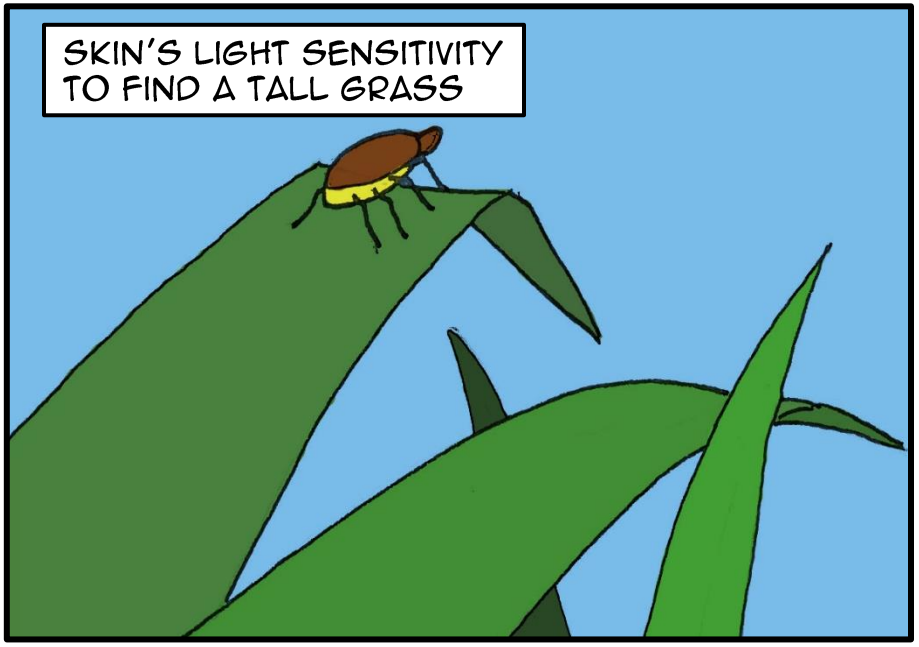
"FEELSPACE BELT"
NAGEL, S. K., CARL, C., KRINGE, T., MÄRTIN, R., & KÖNIG, P.

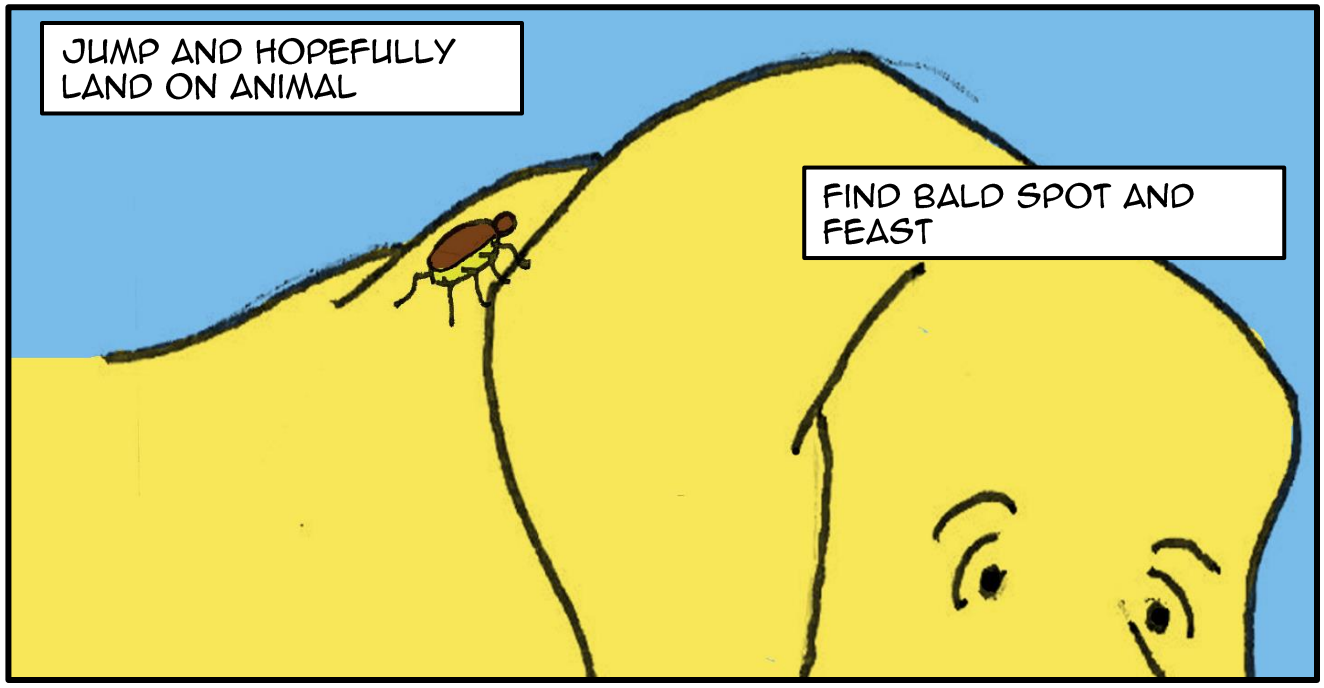


"BODY HACKING: MY MAGNETIC IMPLANT"
D. BERG

"MOMO: A HAPTIC NAVIGATION DEVICE"
C. WANG AND K. O'FRIEL

DIGITAL SYNESTHESIA





THE TICK UNDERSTANDS ONLY THREE SIGNS

SMELL

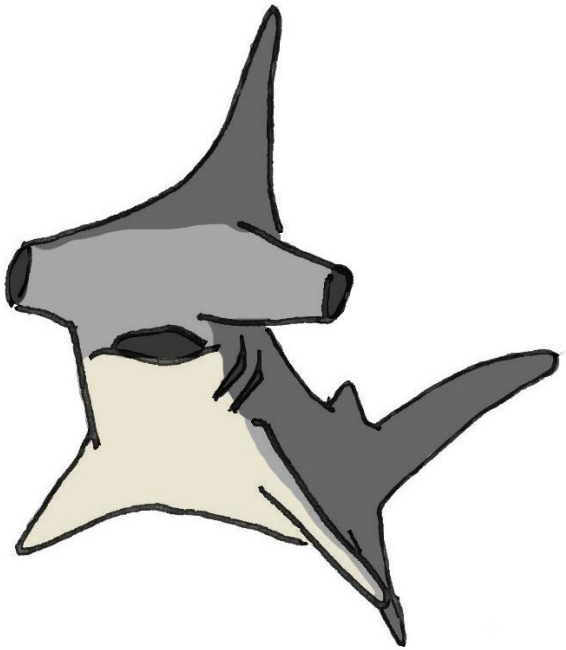
TEMPERATURE

HAIRINESS

"A FORAY INTO THE WORLDS OF ANIMALS AND HUMANS"
JAKOB VON UEXKÜLL

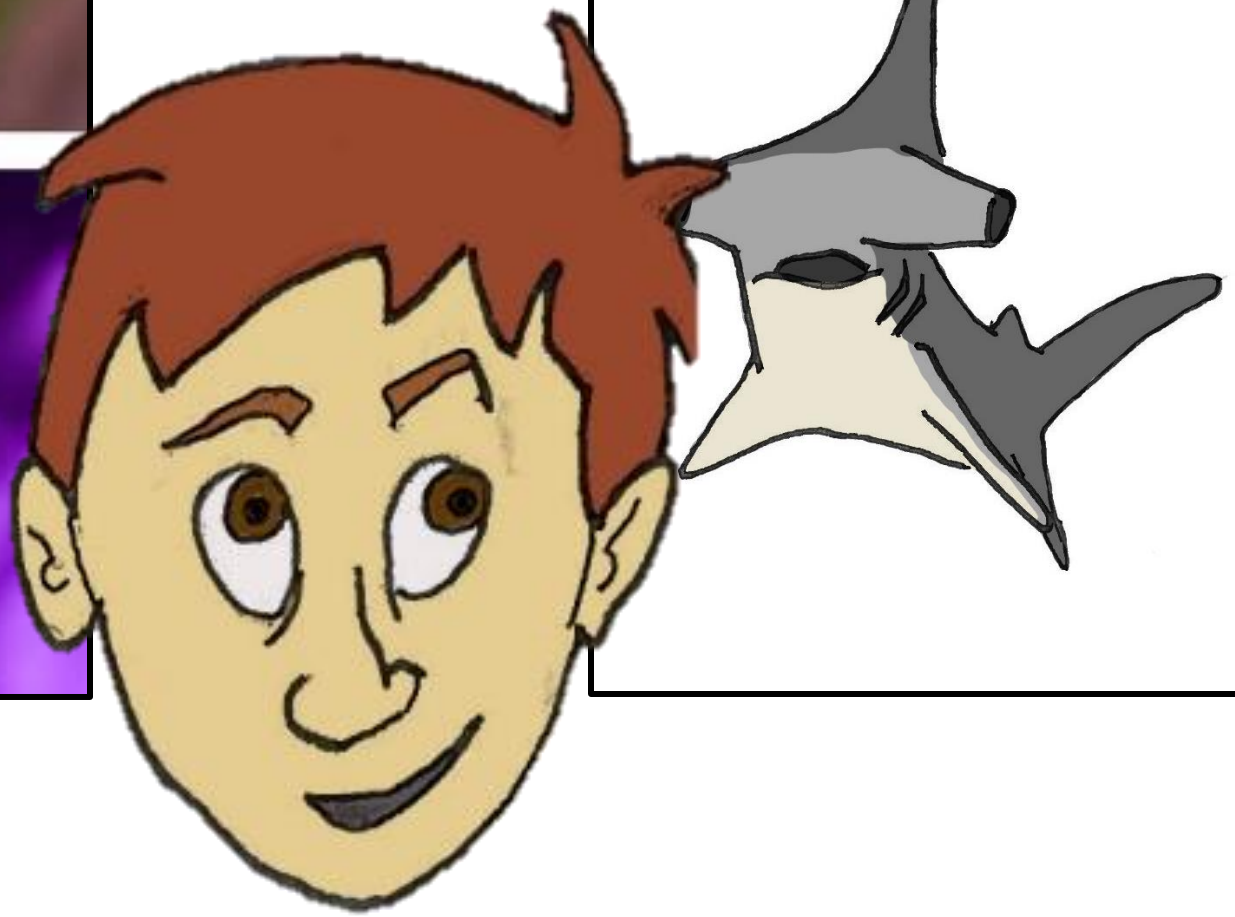
BEES CAN USE UV LIGHT TO PICK FLOWERS

HAMMER-HEAD SHARKS HUNT SENSING ELECTRIC SIGNALS FROM THE MUSCLES OF PREY



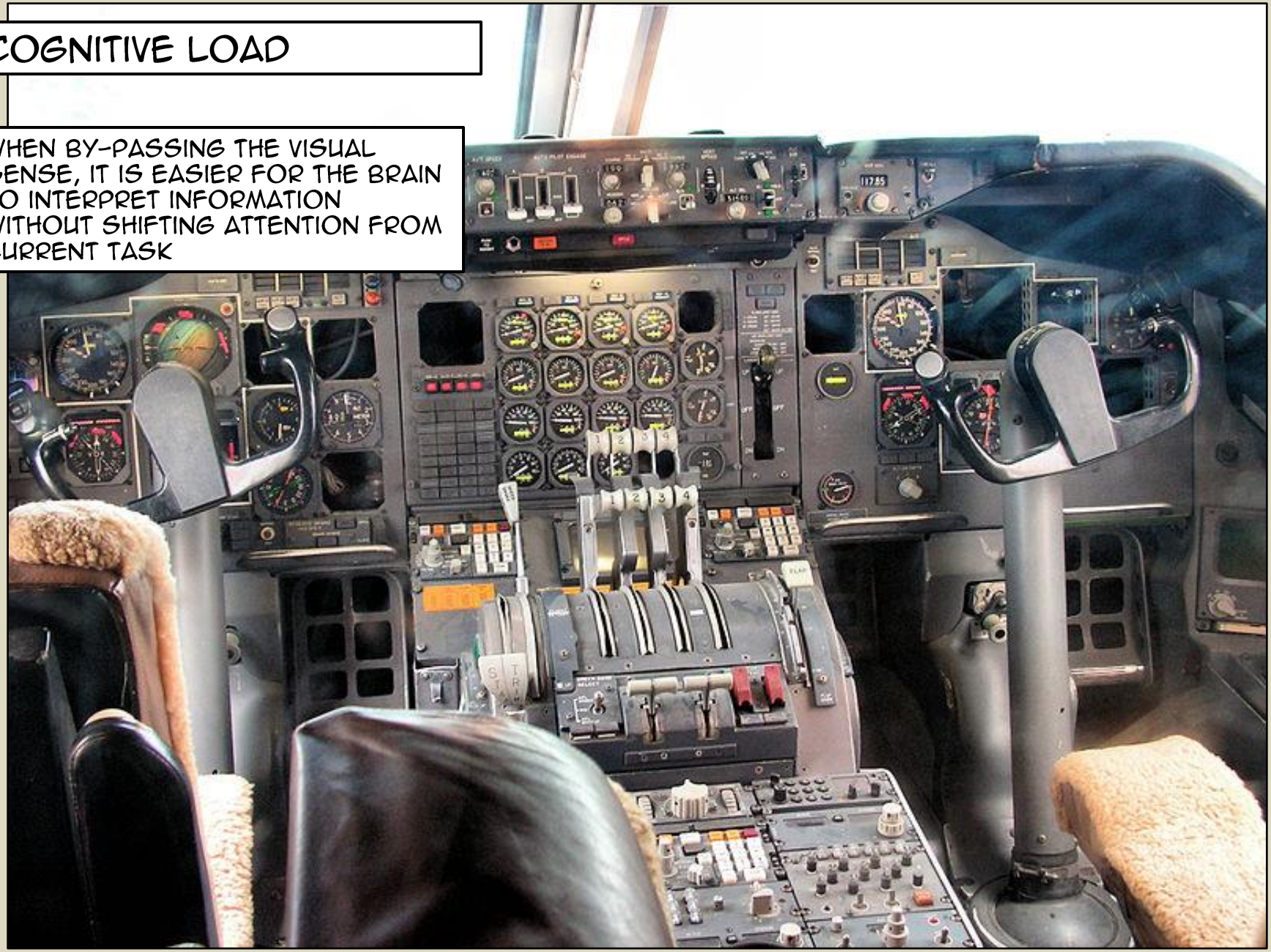
BEES CAN USE UV LIGHT TO PICK FLOWERS

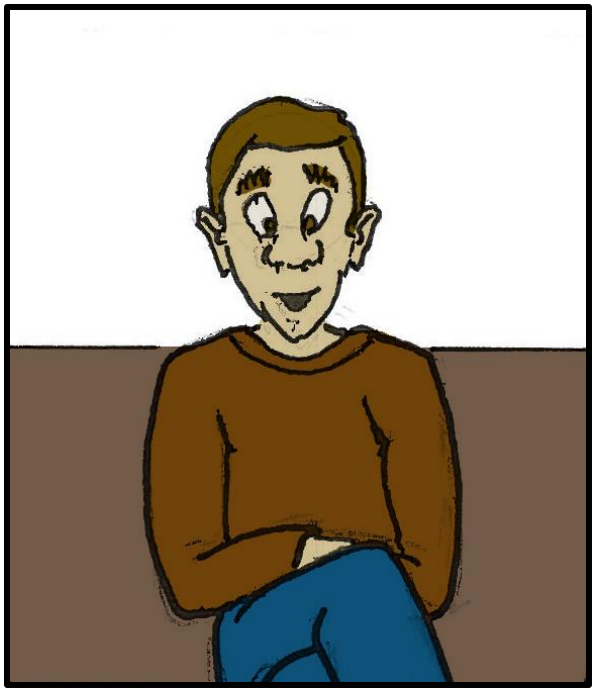
HAMMER-HEAD SHARKS HUNT SENSING ELECTRIC SIGNALS FROM THE MUSCLES OF PREY



COGNITIVE LOAD

WHEN BY-PASSING THE VISUAL SENSE, IT IS EASIER FOR THE BRAIN TO INTERPRET INFORMATION WITHOUT SHIFTING ATTENTION FROM CURRENT TASK






WE ALL FEEL THE SAME CONDITIONS IN A DIFFERENT WAY

RESEARCH PLAN

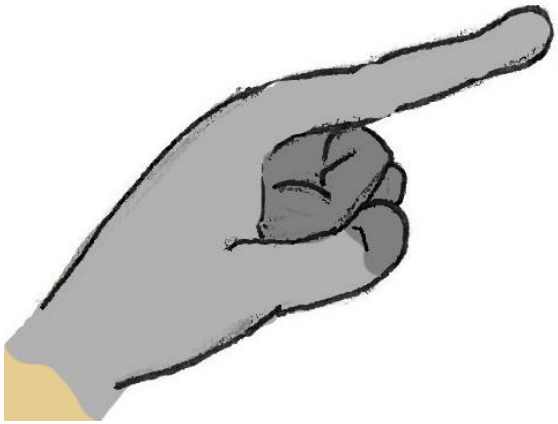
STAGE I:
COMPARE NATURAL AND ARTIFICIAL SENSES

STAGE II:
NEW SENSES IN A KNOWN CONTEXT

STAGE III:
NEW SENSES WITH UNKNOWN CONTEXT

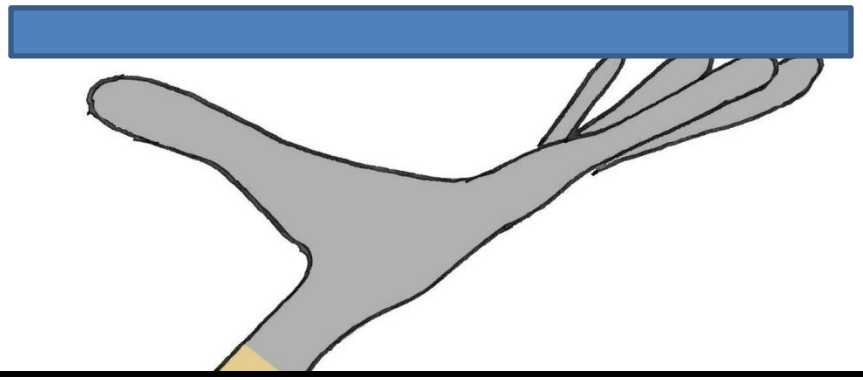
STAGE IV:
GENERALIZING PROJECTIONS OF SYNESTHETIC DESIGN

RESEARCH PLAN, STAGE 1

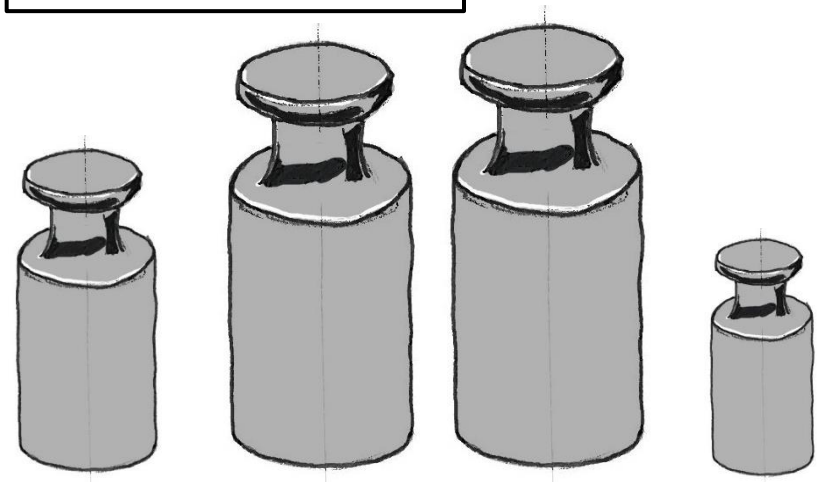


A GLOVE WITH A PRESSURE SENSOR...

THE USER WILL HOLD A TRAY AND LOCATE VARIOUS OBJECTS ON IT



THE TASK IS TO ORGANIZE THE OBJECTS ACCORDING TO WEIGHT



RESEARCH QUESTIONS, STAGE 1

DISCREET OR CONTINUOUS?

DOES THE USER FIND DISCREET SIGNALS BETTER THAN A CONTINUOUS CHANGING SIGNAL?
DOES THIS DEPEND ON THE EXPERIENCE?

SENSE AUGMENTATION?

IS THERE A BENEFIT OF THE ARTIFICIAL SENSE OVER THE NATURAL SENSE WHEN USED TOGETHER?

SENSE SUBSTITUTION?

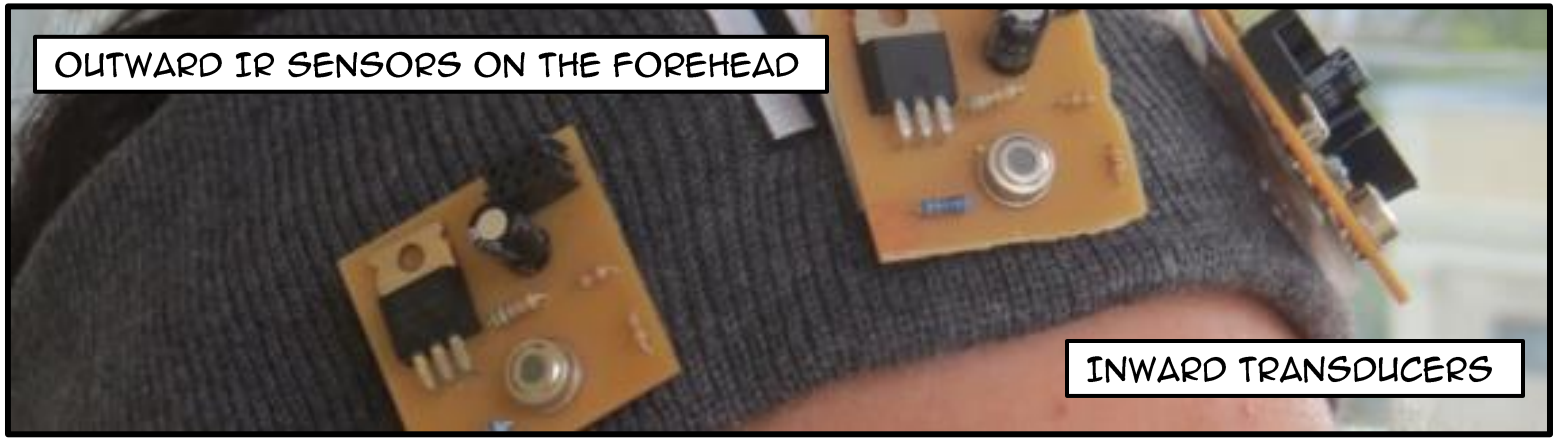
CAN THIS ARTIFICIAL SENSE REPLACE AN EXISTING SENSE FOR THE GIVEN ACTIVITY?

NEW STIMULI?

HOW ACCURATE IS THE DIGITAL SENSE IN COMPARISON TO THE NATURAL SENSE?

RESEARCH PLAN, STAGE II

HEAD BAND



RESEARCH QUESTIONS, STAGE II

NEW SENSES?

HOW DOES THE USER PERFORM WHEN HAVING ACCESS TO A NEW SENSE?

NEW STIMULI?

HOW ACCURATE IS THE DIGITAL SENSE IN THE CONTEXT?

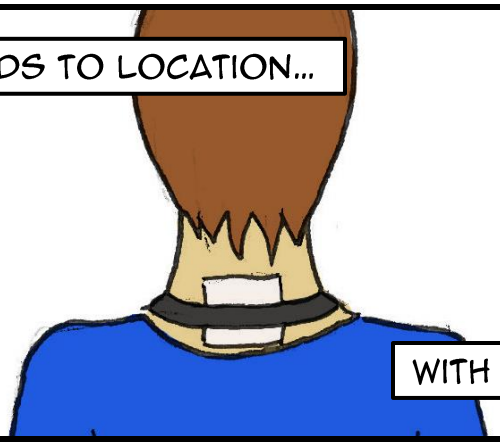
SENSE SUBSTITUTION?

CAN THIS ARTIFICIAL SENSE REPLACE AN EXISTING SENSE FOR THE GIVEN ACTIVITY?
IS THERE A PHANTOM SENSE FEELING?
IS THERE A DIFFERENCE DEPENDING ON THE USER'S FAMILIARITY WITH THE TASK?

RESEARCH PLAN, STAGE III

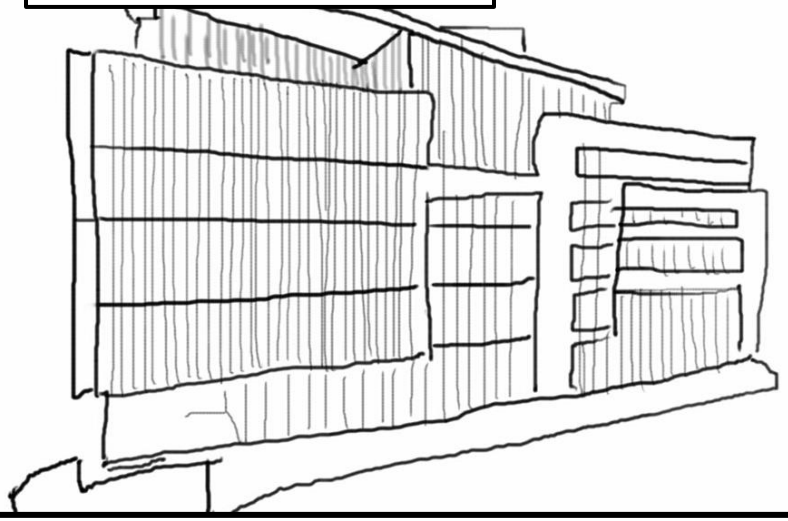
NECK

PELTIER DEVICE RESPONDS TO LOCATION...



WITH THE GLASS INFRASTRUCTURE

INTERACT WITH THE LAB



USE DOPPELLAB TO INTERACT WITH THE USER

RESEARCH QUESTIONS, STAGE III

HUMAN DEVELOPMENT?

WHEN LEARNING A NEW SENSE, ARE CHILDREN BETTER AT IT THAN ADULTS?

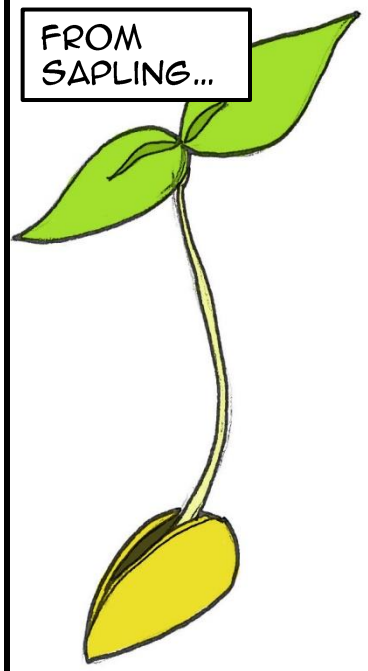
NEW STIMULI?

HOW FAST TO USERS UNDERSTAND THE NEW STIMULI?
DOES IT DEPEND ON THE ACTIVITY OR THE FEEDBACK?

RESEARCH PLAN, STAGE IV

DESIGN THINKING

FROM SAPLING...



... TO TREE

RESEARCH QUESTIONS, STAGE IV

ESCAPING THE VISUAL INTERFACE?

CAN THIS ARTIFICIAL SENSE REPLACE AN EXISTING SENSE FOR THE GIVEN ACTIVITY?

DESIGN THINKING?

CAN A PATTERN BE IDENTIFIED TO GENERALIZE A DIGITAL SYNESTHESIA DESIGN PROCESS?

TIMELINE

PHASE ONE (JANUARY – MARCH)
THIS STAGE IS DEALING WITH THE FINAL CONTEXTS THAT WILL BE DEVELOPED TO PROVE MY THESIS AS WELL AS GETTING THE PROPOSAL SUBMITTED AND APPROVED BY MASCOM AND DEFENDED.

THIS IS THE DEVELOPMENT STAGE. FABRICATION AND INITIAL TESTING OF THE DEVICES

PHASE TWO (MARCH – APRIL)
FINAL TESTING WILL BE MADE OF EACH OF THE SYSTEMS FOR THE CONTEXTS CHOSEN. EXTRA ATTENTION WILL BE PUT ON THE MOBILITY OF THE SYSTEM AND ITS FUTURE DEPLOYMENT OUTSIDE THE LAB. USER TESTING ON THE FIRST STAGE WILL BEGIN.

PHASE THREE (MAY – JUNE)
USER TESTING WILL BE DONE FOR THE SECOND AND THIRD STAGES.

PHASE FOUR (JULY – AUGUST)
THESIS WRITING AND DEFENSE.

THE END

THANK YOU...

QUESTIONS?