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Paper Street View: A Guided Tour of Design and Making Using Comics

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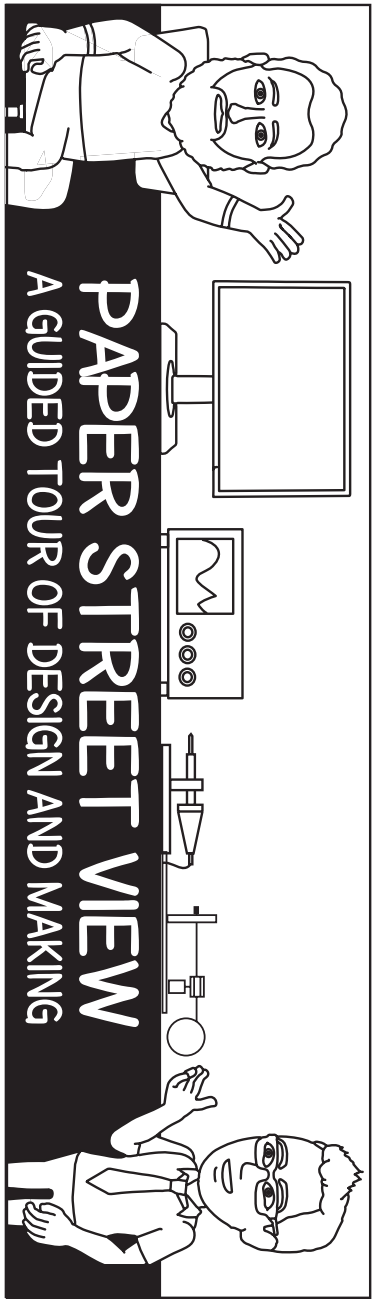

Paper Street View: A Guided Tour of Design and Making Using Comics

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Abstract
This comic reveals multilayered details and insights about the design and making of Paper Street View, a suite of artefacts that allow groups of older people in care environments to navigate Google Street View using a paper map. In creating the comic we wanted to account for material thinking in design. We show that comics can be used as a dynamic and visual way of presenting and composing discussions about making. Comics allow you to talk around artefacts gathered during the design process (i.e. CAD drawings, prototypes, sketches and notes) and encourage a more dynamic use of image and text.

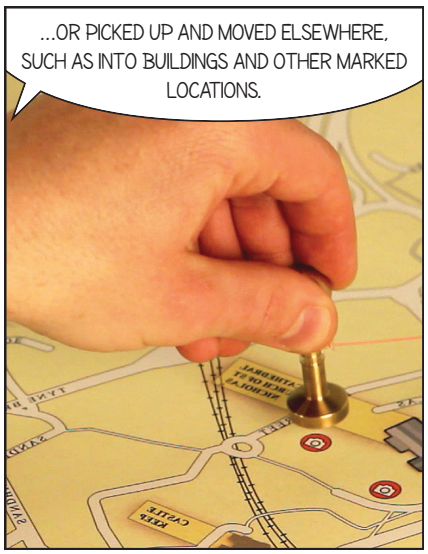
Authors Keywords
Design, craft, process, comics

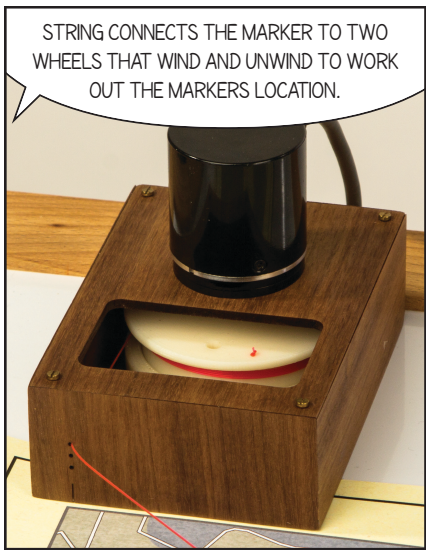
ACM Classification Keywords
H.5.m. Information interfaces and presentation

Introduction
This pictorial builds on the work of Jarvis et al. [2] and Gaver and Bowers [1] in considering more visual approaches to the representation of design artefacts in HCI. It was in part inspired by the work of Scott McCloud [3], who talks about the descriptive power of comics through his cartoon self. We have reflected more fully on the potential of comics in a full paper [4]. We see this pictorial as a standalone contribution demonstrating how comics can holistically represent multi-faceted elements of design and making.

HELLO, I'M TOMMY AND TODAY I WANT TO TELL YOU HOW I MADE PAPER STREET VIEW.
THIS WAS DESIGNED AS A GROUP LEISURE ACTIVITY FOR OLDER PEOPLE WITH DEMENTIA IN CARE.
22 Dean Street
IT LET'S PEOPLE SIT AROUND AND LOOK AT PLACES ON AN ORDINARY PAPER MAP. HERE I MADE AN EASILY READ TOURIST MAP OF THE CITY.
NEWCASTLE AND GATESHEAD

YOUR LOCATION IS REPRESENTED BY A BRASS MARKER. THIS CAN BE PUSHED IN ORDER TO WALK ALONG STREETS AT A GENTLE PACE...


...OR PICKED UP AND MOVED ELSEWHERE, SUCH AS INTO BUILDINGS AND OTHER MARKED LOCATIONS.


STRING CONNECTS THE MARKER TO TWO WHEELS THAT WIND AND UNWIND TO WORK OUT THE MARKERS LOCATION.

IF YOU WANT TO LOOK AROUND, YOU CAN SPIN A FREELY ROTATING COMPASS.

THIS CAN ALSO BE PICKED UP AND HELD AWAY FROM THE BOARD.

THERE'S A LOT I COULD SAY ABOUT PAPER STREET VIEW. WE DON'T HAVE A LOT OF TIME THOUGH, SO TODAY I'LL FOCUS ON DESIGN AND MAKING.
WORK WITH ALZHEIMER'S SOCIETY
DEPLOYMENT
OTHER IDEAS
CARE HOMES

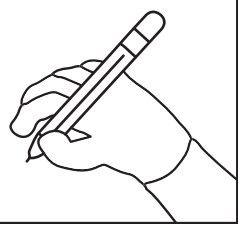
WE BEGIN JUST AFTER I HAD DECIDED TO MAKE A PAPER VERSION OF GOOGLE STREET VIEW.

NOW... LETS FIRSTLY SEE IF I CAN GET AN ACCURATE GEOGRAPHICAL COORDINATE FROM THIS PAPER MAP.

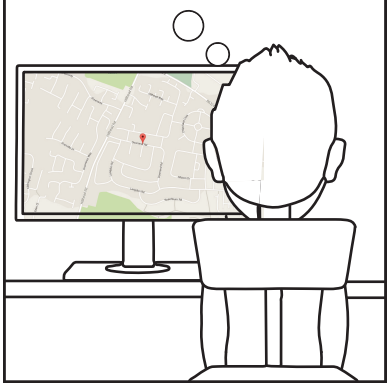
Lon(x) = x/width x Lon0 - Lon1 +Lon1
= 0.3714 X 0.021457 + -1.673312
= -1.6653429

Lat(y) = y/height x Lat0 -Lat1 + Lat1
= 0.5285 X 0.008613 + 54.969237
= 54.973298

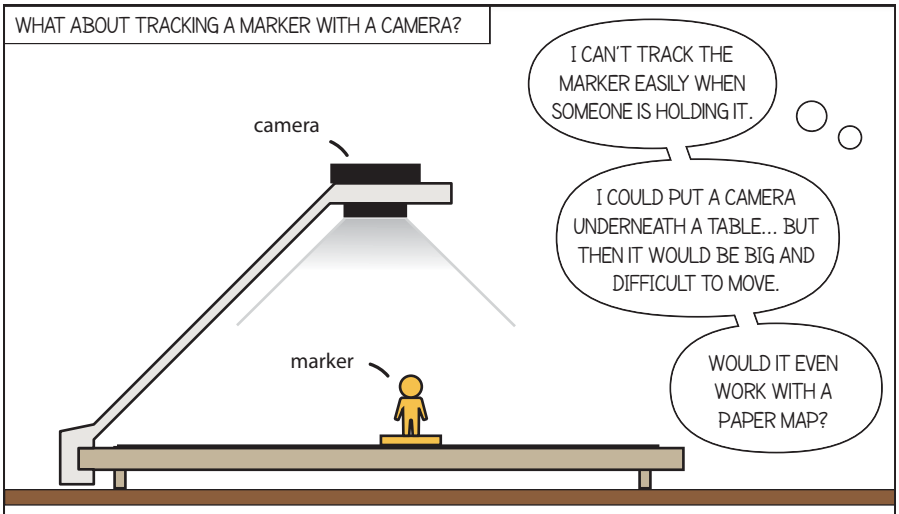
Location = 54.973298, -1.665343



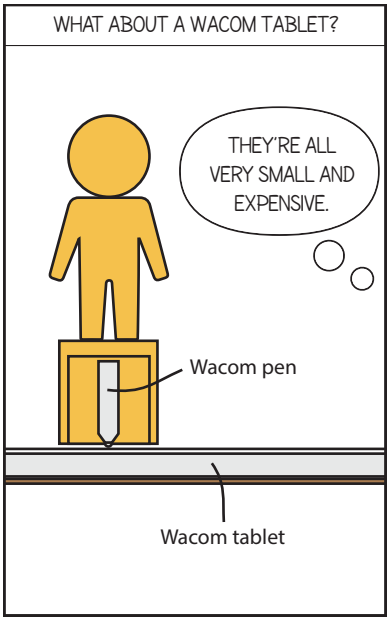
WOW! NICE...THIS IS THE SAME LOCATION. I JUST NEED A MARKER THAT TELLS ME IT'S POSITION AND THEN I CAN GET PANORAMAS FROM THE GOOGLE MAPS API.



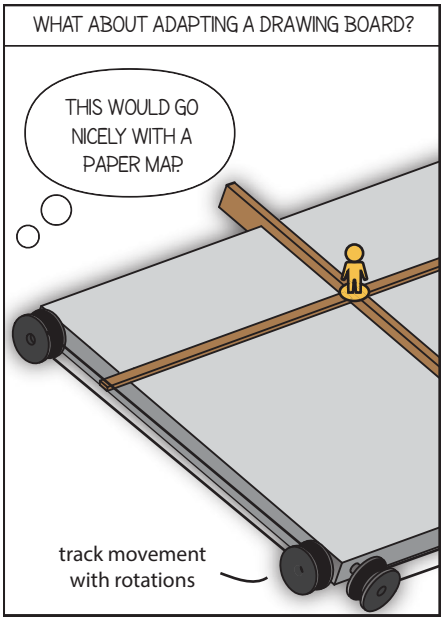
WHAT ABOUT TRACKING A MARKER WITH A CAMERA?

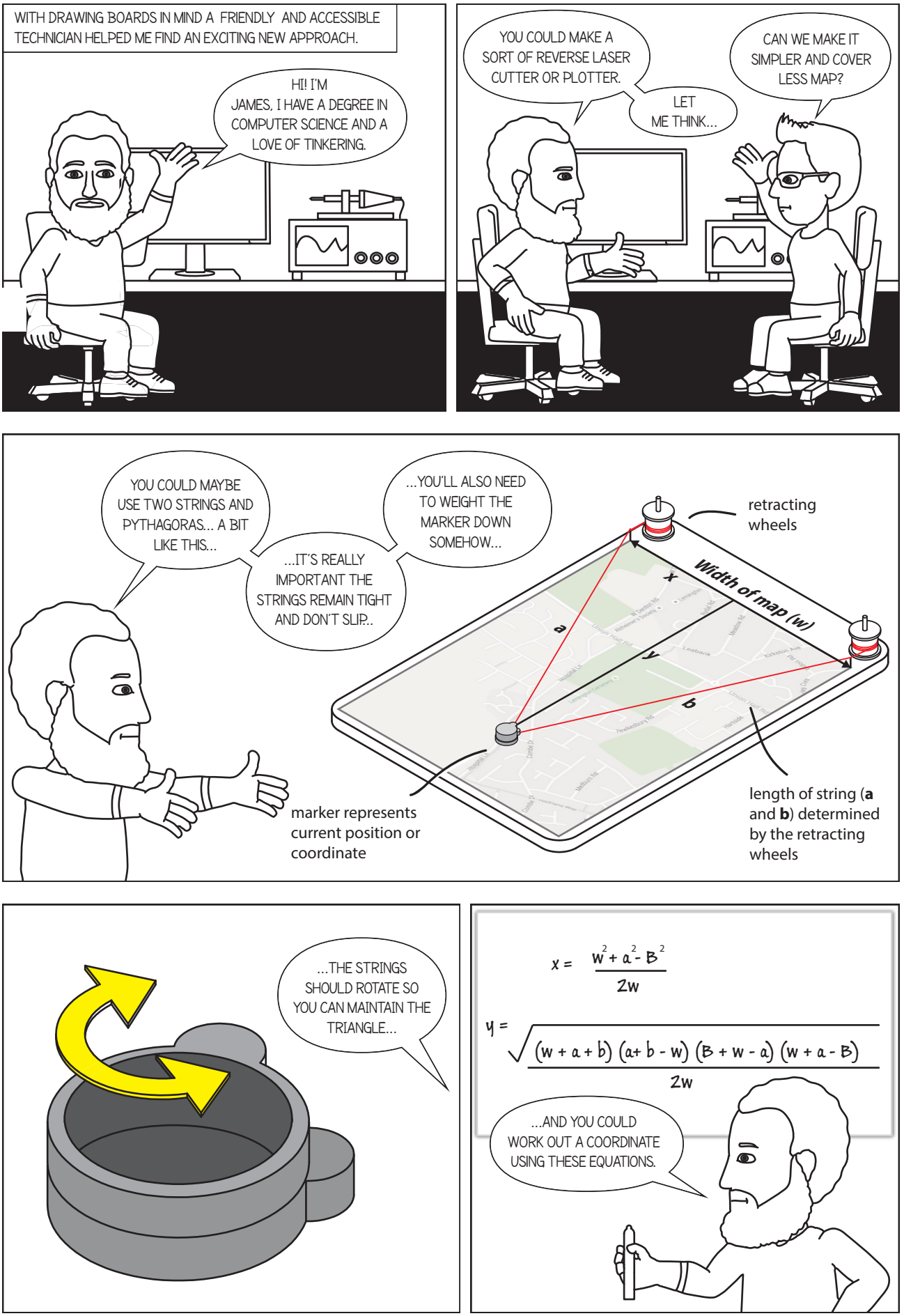


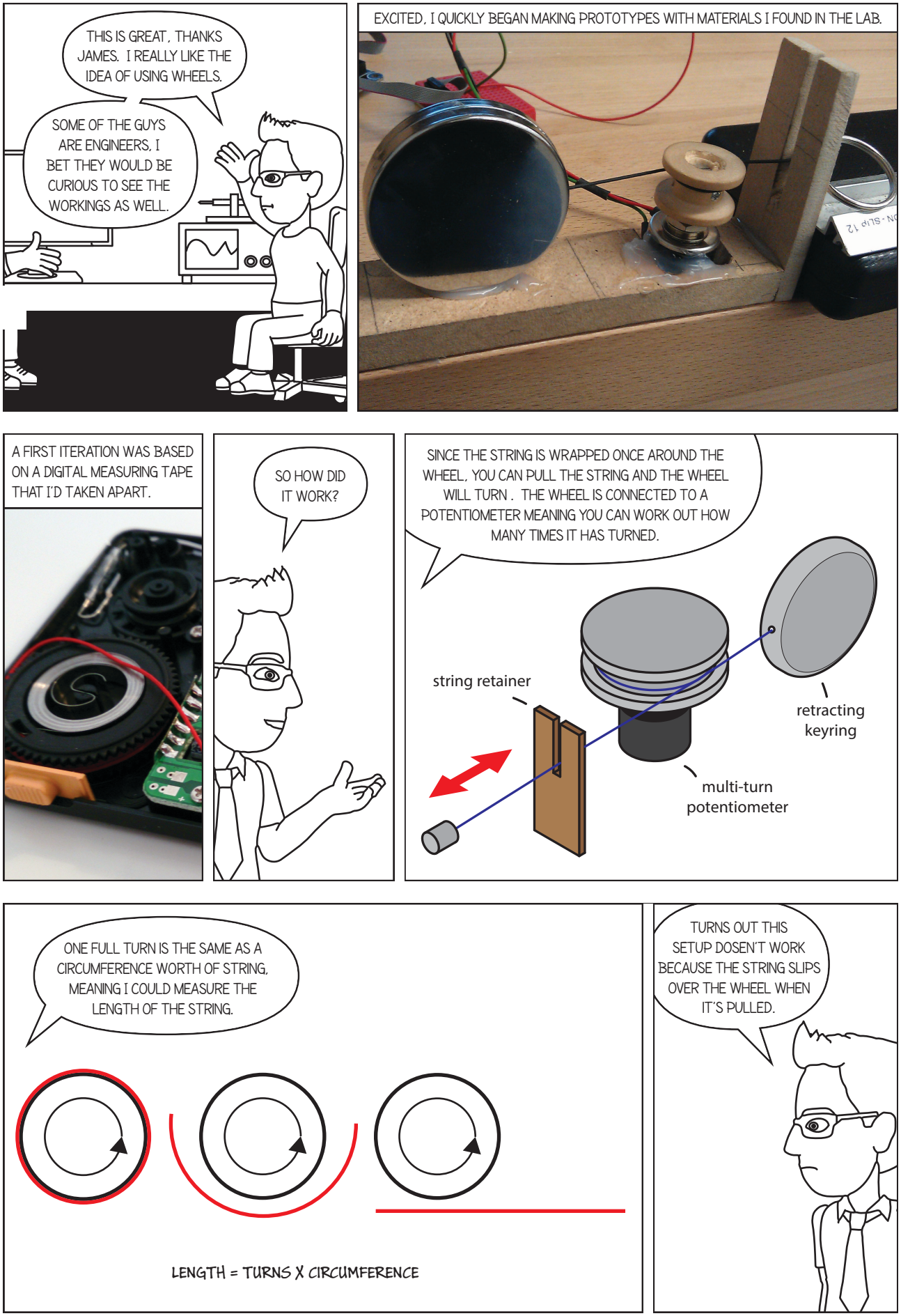
WHAT ABOUT A WACOM TABLET?

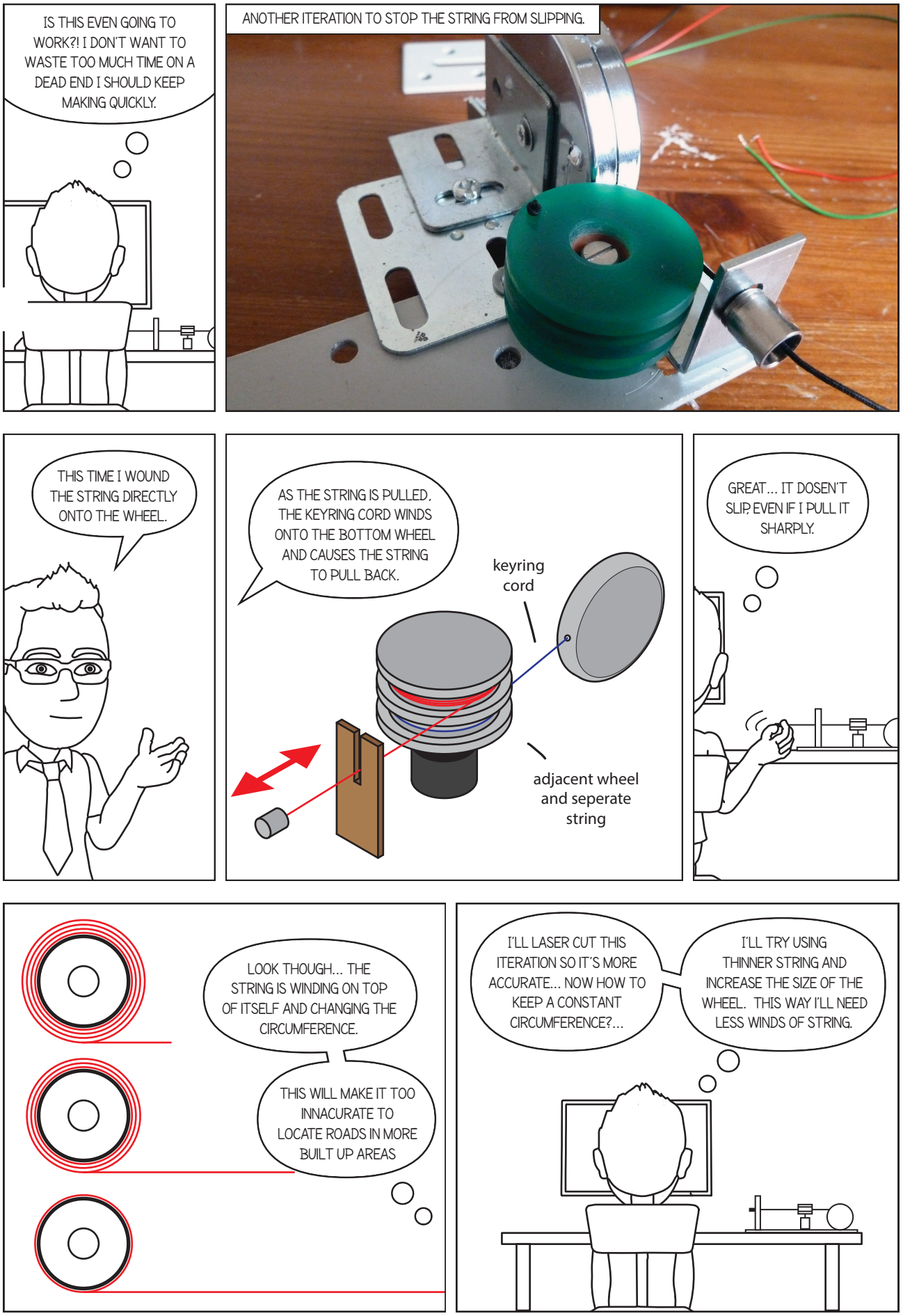


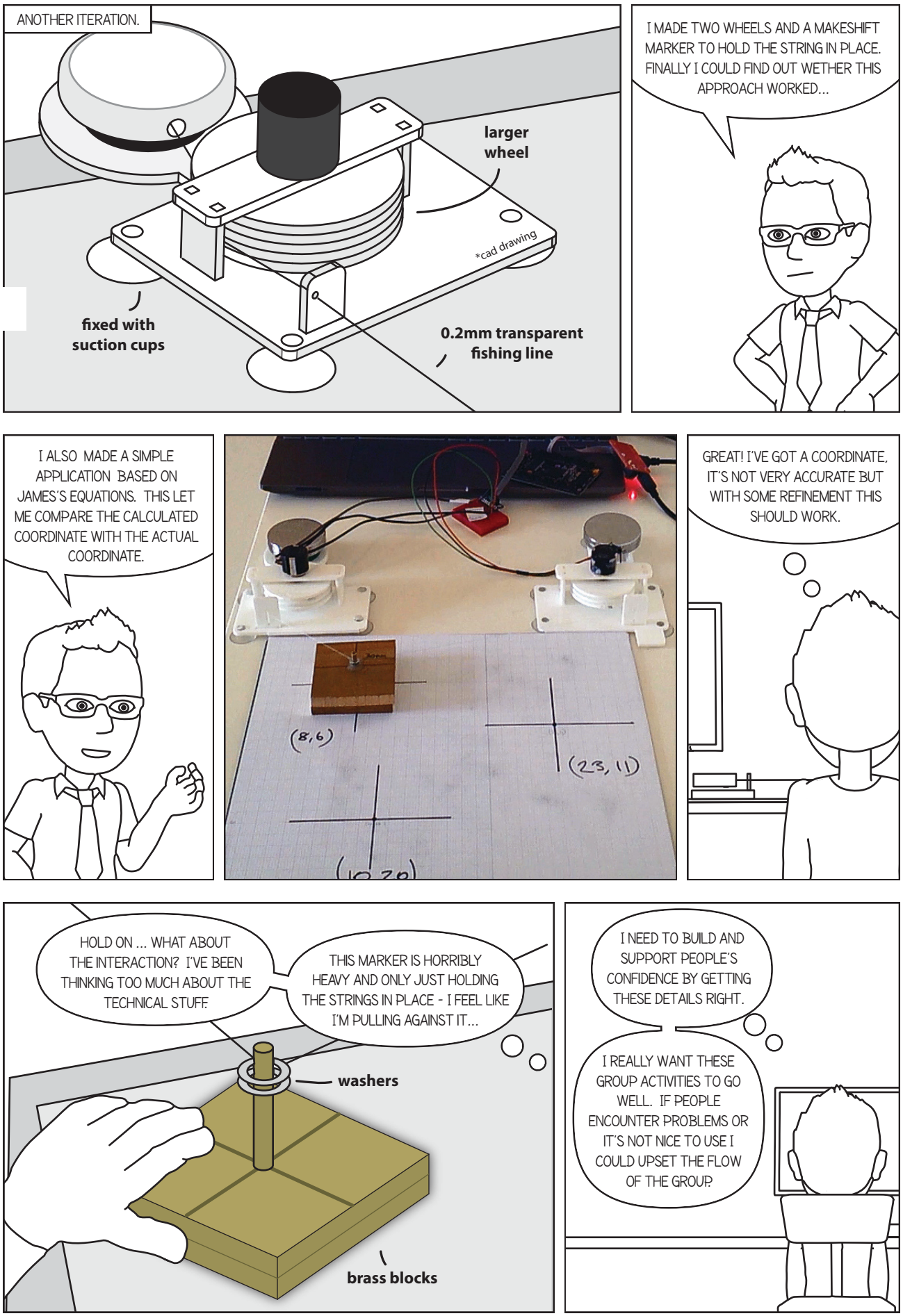
WHAT ABOUT ADAPTING A DRAWING BOARD?

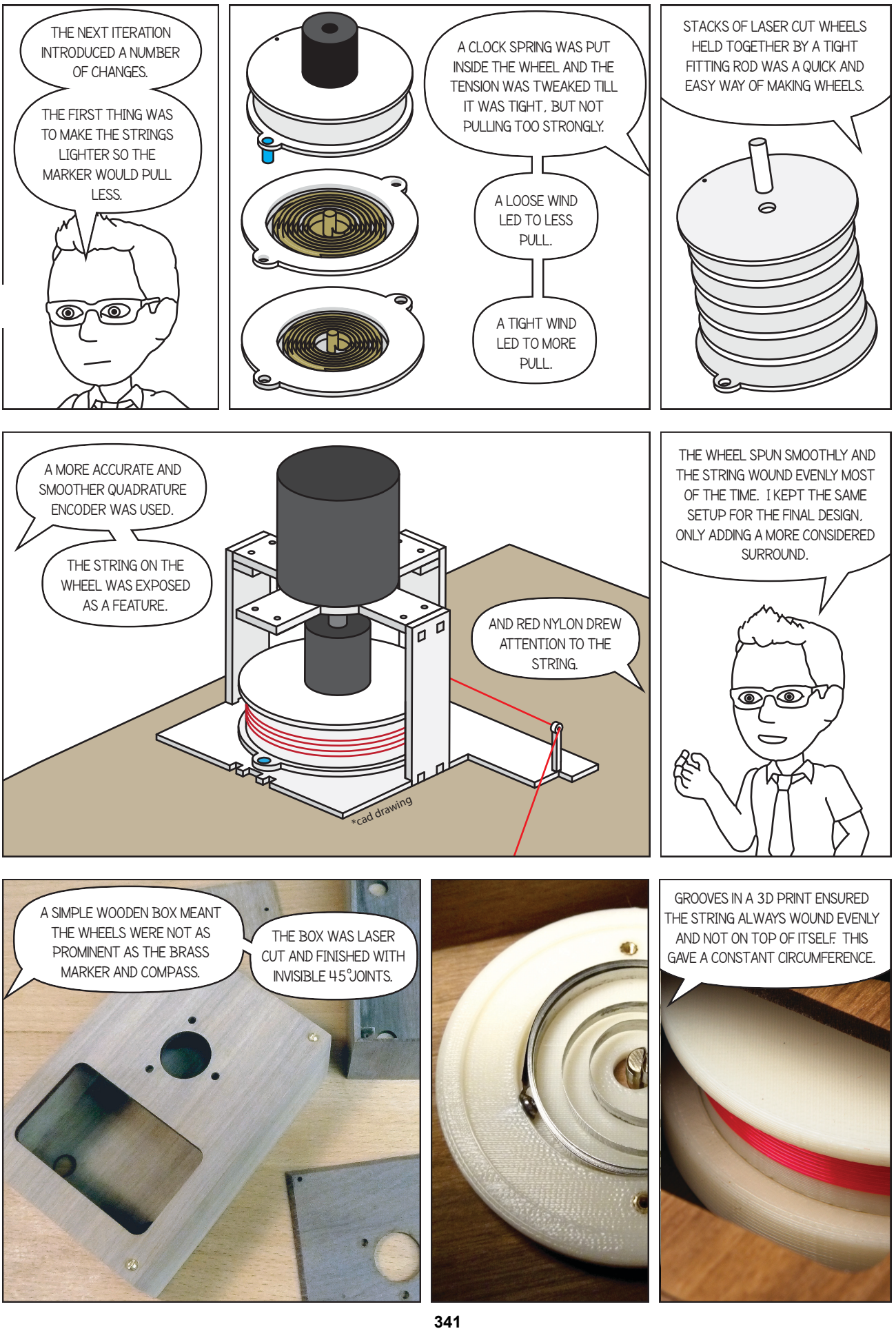


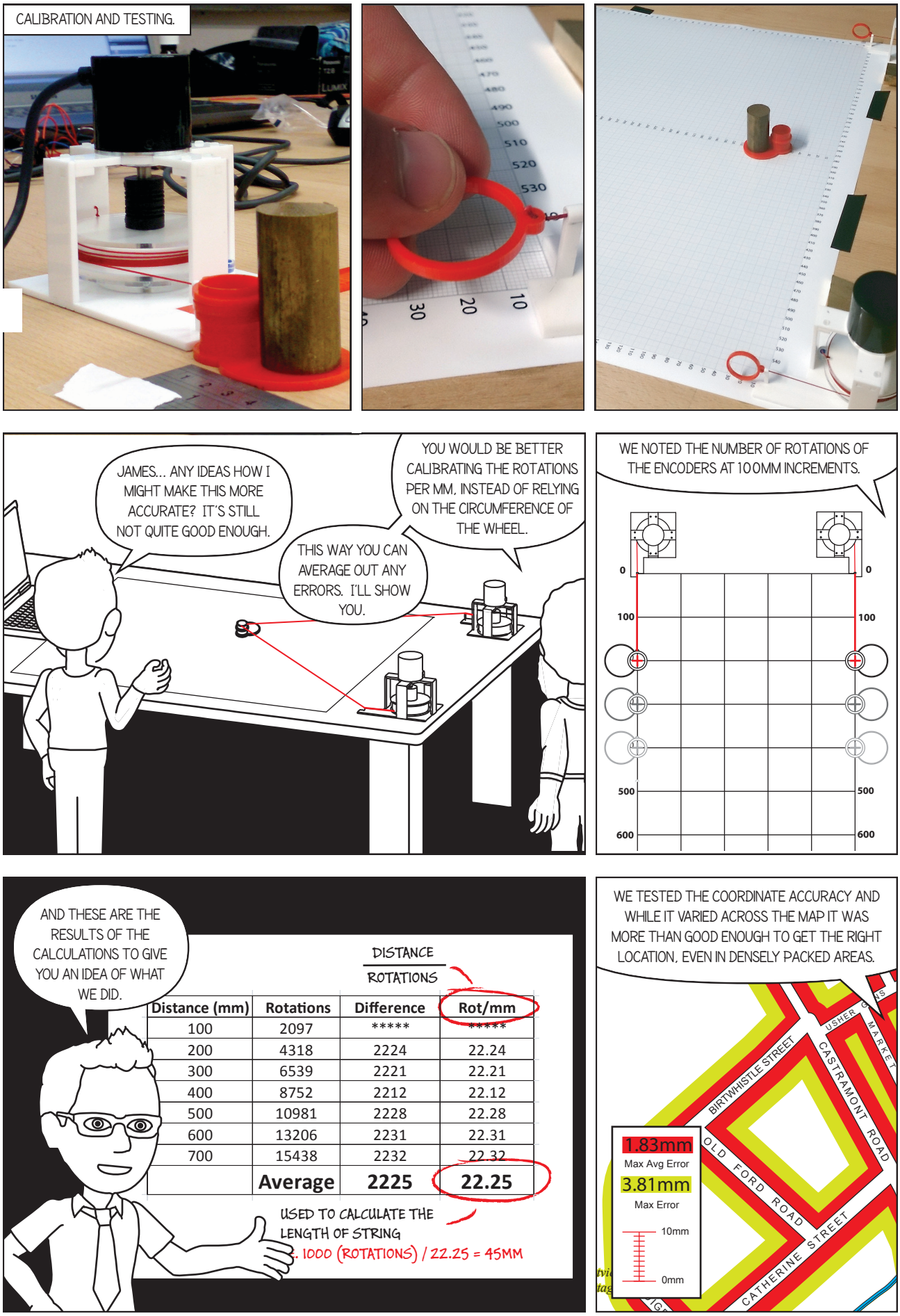

WITH DRAWING BOARDS IN MIND A FRIENDLY AND ACCESSIBLE TECHNICIAN HELPED ME FIND AN EXCITING NEW APPROACH.
HI! I'M JAMES, I HAVE A DEGREE IN COMPUTER SCIENCE AND A LOVE OF TINKERING.
YOU COULD MAKE A SORT OF REVERSE LASER CUTTER OR PLOTTER.
LET ME THINK...
CAN WE MAKE IT SIMPLER AND COVER LESS MAP?
YOU COULD MAYBE USE TWO STRINGS AND PYTHAGORAS... A BIT LIKE THIS...
...IT'S REALLY IMPORTANT THE STRINGS REMAIN TIGHT AND DON'T SLIP..
...YOU'LL ALSO NEED TO WEIGHT THE MARKER DOWN SOMEHOW...
retracting wheels
Width of map (w)
x
a
y
b
marker represents current position or coordinate
length of string (a and b) determined by the retracting wheels
...THE STRINGS SHOULD ROTATE SO YOU CAN MAINTAIN THE TRIANGLE...
$x = \frac{w^2 + a^2 - B^2}{2w}$
$y = \frac{\sqrt{(w + a + b)(a + b - w)(B + w - a)(w + a - B)}}{2w}$
...AND YOU COULD WORK OUT A COORDINATE USING THESE EQUATIONS.

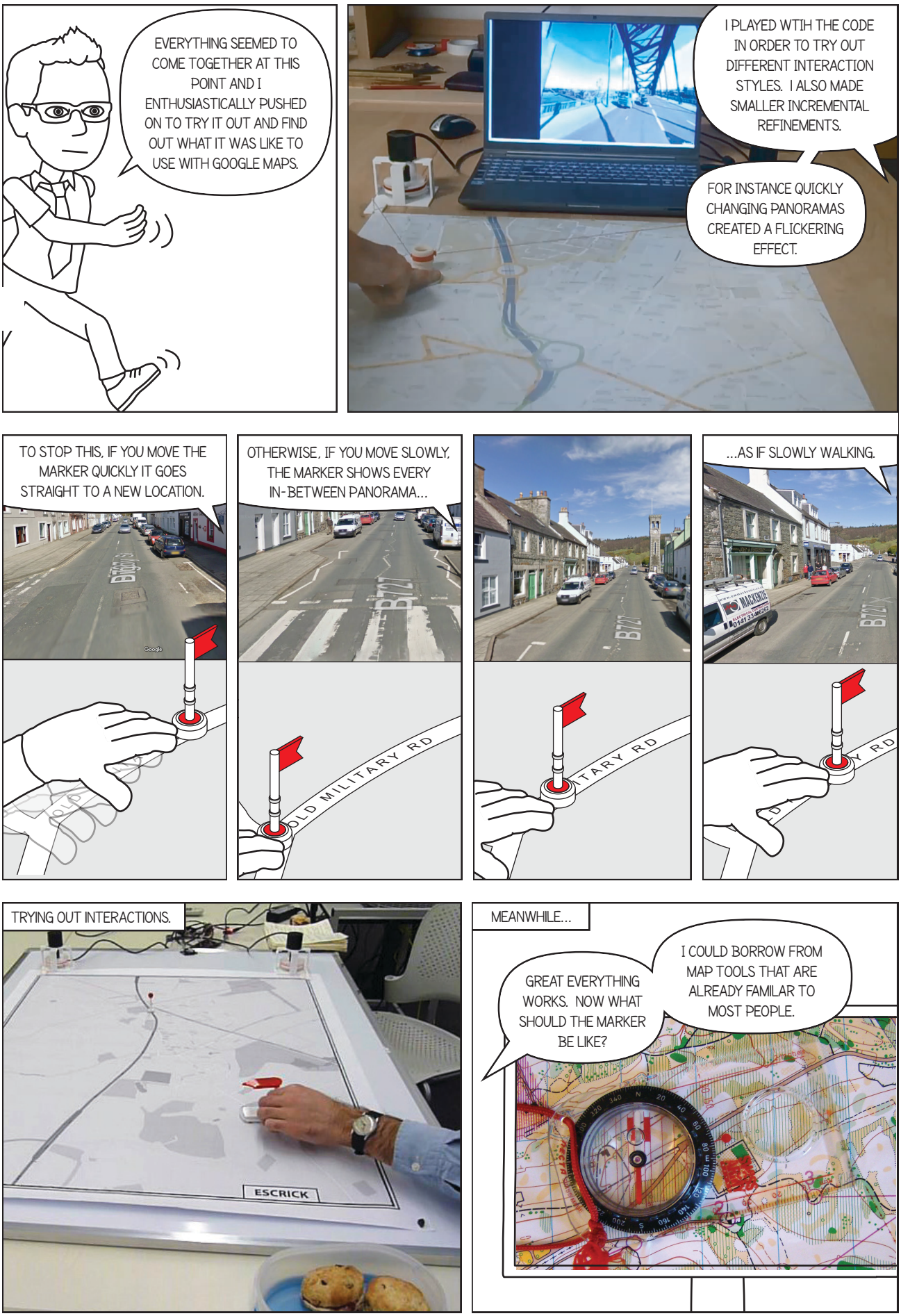

THIS IS GREAT, THANKS JAMES. I REALLY LIKE THE IDEA OF USING WHEELS.
SOME OF THE GUYS ARE ENGINEERS, I BET THEY WOULD BE CURIOUS TO SEE THE WORKINGS AS WELL.
EXCITED, I QUICKLY BEGAN MAKING PROTOTYPES WITH MATERIALS I FOUND IN THE LAB.
A FIRST ITERATION WAS BASED ON A DIGITAL MEASURING TAPE THAT I'D TAKEN APART.
SO HOW DID IT WORK?
SINCE THE STRING IS WRAPPED ONCE AROUND THE WHEEL, YOU CAN PULL THE STRING AND THE WHEEL WILL TURN . THE WHEEL IS CONNECTED TO A POTENTIOMETER MEANING YOU CAN WORK OUT HOW MANY TIMES IT HAS TURNED.
string retainer
retracting keyring
multi-turn potentiometer
ONE FULL TURN IS THE SAME AS A CIRCUMFERENCE WORTH OF STRING, MEANING I COULD MEASURE THE LENGTH OF THE STRING.
LENGTH = TURNS X CIRCUMFERENCE
TURNS OUT THIS SETUP DOSEN'T WORK BECAUSE THE STRING SLIPS OVER THE WHEEL WHEN IT'S PULLED.

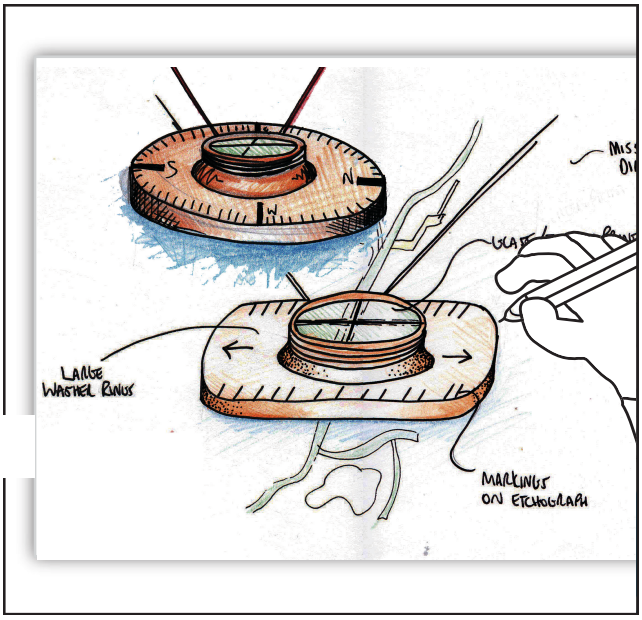

IS THIS EVEN GOING TO WORK?! I DON'T WANT TO WASTE TOO MUCH TIME ON A DEAD END I SHOULD KEEP MAKING QUICKLY.
ANOTHER ITERATION TO STOP THE STRING FROM SLIPPING.
THIS TIME I WOUND THE STRING DIRECTLY ONTO THE WHEEL.
AS THE STRING IS PULLED, THE KEYRING CORD WINDS ONTO THE BOTTOM WHEEL AND CAUSES THE STRING TO PULL BACK.
keyring cord
adjacent wheel and seperate string
GREAT... IT DOSEN'T SLIP EVEN IF I PULL IT SHARPLY.
LOOK THOUGH... THE STRING IS WINDING ON TOP OF ITSELF AND CHANGING THE CIRCUMFERENCE.
THIS WILL MAKE IT TOO INNACURATE TO LOCATE ROADS IN MORE BUILT UP AREAS
I'LL LASER CUT THIS ITERATION SO IT'S MORE ACCURATE... NOW HOW TO KEEP A CONSTANT CIRCUMFERENCE?...
I'LL TRY USING THINNER STRING AND INCREASE THE SIZE OF THE WHEEL. THIS WAY I'LL NEED LESS WINDS OF STRING.

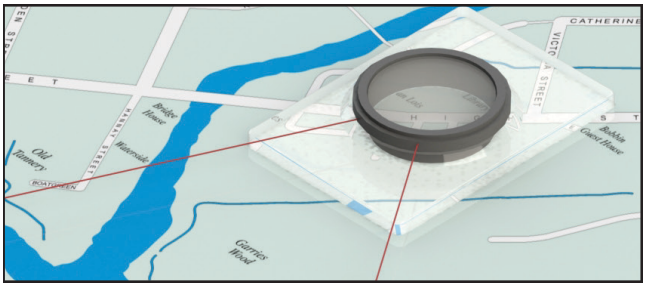

ANOTHER ITERATION.
larger wheel
*cad drawing
fixed with suction cups
0.2mm transparent fishing line
I MADE TWO WHEELS AND A MAKESHIFT MARKER TO HOLD THE STRING IN PLACE. FINALLY I COULD FIND OUT WETHER THIS APPROACH WORKED...
I ALSO MADE A SIMPLE APPLICATION BASED ON JAMES'S EQUATIONS. THIS LET ME COMPARE THE CALCULATED COORDINATE WITH THE ACTUAL COORDINATE.
(8,6)
(23,11)
GREAT! I'VE GOT A COORDINATE, IT'S NOT VERY ACCURATE BUT WITH SOME REFINEMENT THIS SHOULD WORK.
HOLD ON ... WHAT ABOUT THE INTERACTION? I'VE BEEN THINKING TOO MUCH ABOUT THE TECHNICAL STUFF.
THIS MARKER IS HORRIBLY HEAVY AND ONLY JUST HOLDING THE STRINGS IN PLACE - I FEEL LIKE I'M PULLING AGAINST IT...
washers
brass blocks
I NEED TO BUILD AND SUPPORT PEOPLE'S CONFIDENCE BY GETTING THESE DETAILS RIGHT.
I REALLY WANT THESE GROUP ACTIVITIES TO GO WELL. IF PEOPLE ENCOUNTER PROBLEMS OR IT'S NOT NICE TO USE I COULD UPSET THE FLOW OF THE GROUP.

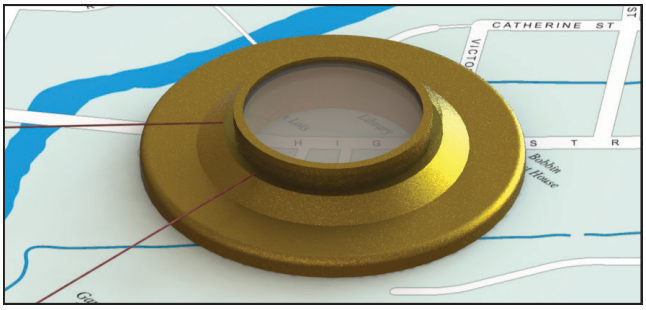

THE NEXT ITERATION INTRODUCED A NUMBER OF CHANGES.
THE FIRST THING WAS TO MAKE THE STRINGS LIGHTER SO THE MARKER WOULD PULL LESS.
A CLOCK SPRING WAS PUT INSIDE THE WHEEL AND THE TENSION WAS TWEAKED TILL IT WAS TIGHT, BUT NOT PULLING TOO STRONGLY.
A LOOSE WIND LED TO LESS PULL.
A TIGHT WIND LED TO MORE PULL.
STACKS OF LASER CUT WHEELS HELD TOGETHER BY A TIGHT FITTING ROD WAS A QUICK AND EASY WAY OF MAKING WHEELS.
A MORE ACCURATE AND SMOOTHER QUADRATURE ENCODER WAS USED.
THE STRING ON THE WHEEL WAS EXPOSED AS A FEATURE.
AND RED NYLON DREW ATTENTION TO THE STRING.
*cad drawing
THE WHEEL SPUN SMOOTHLY AND THE STRING WOUND EVENLY MOST OF THE TIME. I KEPT THE SAME SETUP FOR THE FINAL DESIGN, ONLY ADDING A MORE CONSIDERED SURROUND.
A SIMPLE WOODEN BOX MEANT THE WHEELS WERE NOT AS PROMINENT AS THE BRASS MARKER AND COMPASS.
THE BOX WAS LASER CUT AND FINISHED WITH INVISIBLE 45°JOINTS.
GROOVES IN A 3D PRINT ENSURED THE STRING ALWAYS WOUND EVENLY AND NOT ON TOP OF ITSELF. THIS GAVE A CONSTANT CIRCUMFERENCE.

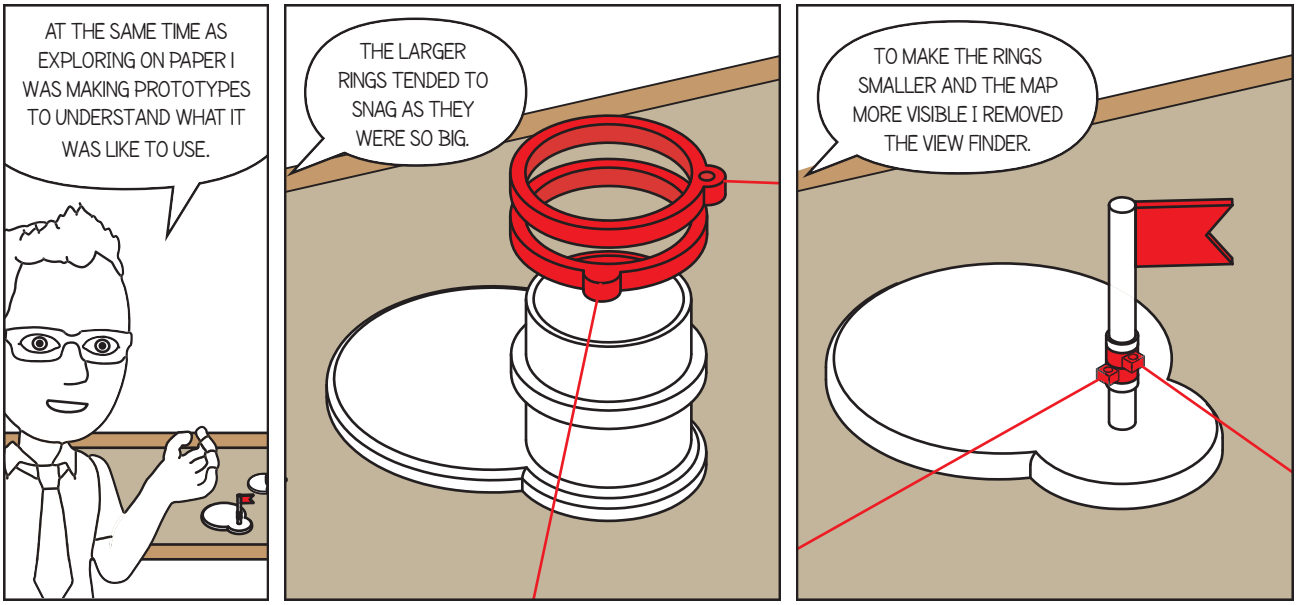

CALIBRATION AND TESTING.
JAMES... ANY IDEAS HOW I MIGHT MAKE THIS MORE ACCURATE? IT'S STILL NOT QUITE GOOD ENOUGH.
YOU WOULD BE BETTER CALIBRATING THE ROTATIONS PER MM, INSTEAD OF RELYING ON THE CIRCUMFERENCE OF THE WHEEL.
THIS WAY YOU CAN AVERAGE OUT ANY ERRORS. I'LL SHOW YOU.
WE NOTED THE NUMBER OF ROTATIONS OF THE ENCODERS AT 100MM INCREMENTS.
0
100
500
600
AND THESE ARE THE RESULTS OF THE CALCULATIONS TO GIVE YOU AN IDEA OF WHAT WE DID.
DISTANCE / ROTATIONS
Distance (mm) | Rotations | Difference | Rot/mm
100 | 2097 | ***** | *****
200 | 4318 | 2224 | 22.24
300 | 6539 | 2221 | 22.21
400 | 8752 | 2212 | 22.12
500 | 10981 | 2228 | 22.28
600 | 13206 | 2231 | 22.31
700 | 15438 | 2232 | 22.32
Average | 2225 | 22.25
USED TO CALCULATE THE LENGTH OF STRING
1000 (ROTATIONS) / 22.25 = 45MM
WE TESTED THE COORDINATE ACCURACY AND WHILE IT VARIED ACROSS THE MAP IT WAS MORE THAN GOOD ENOUGH TO GET THE RIGHT LOCATION, EVEN IN DENSELY PACKED AREAS.
1.83mm
Max Avg Error
3.81mm
Max Error
10mm
0mm
BIRTWHISTLE STREET
CASTRAMONT ROAD
OLD FORD ROAD
CATHERINE STREET
USHER'S MARKET

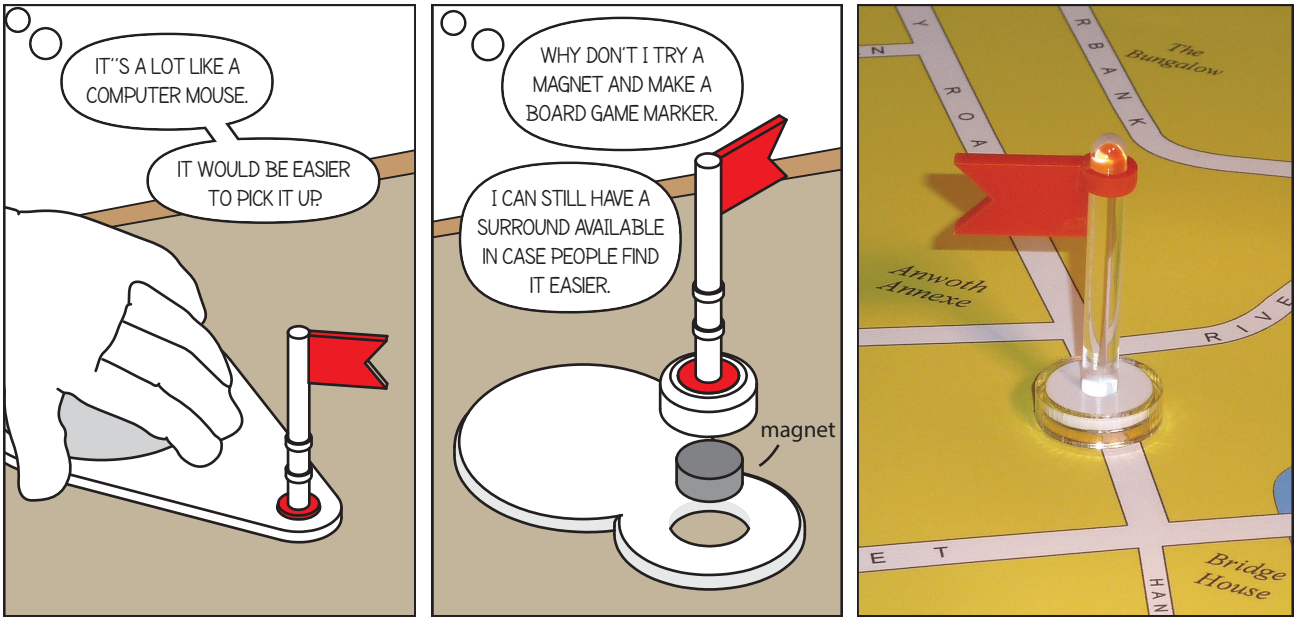

EVERYTHING SEEMED TO COME TOGETHER AT THIS POINT AND I ENTHUSIASTICALLY PUSHED ON TO TRY IT OUT AND FIND OUT WHAT IT WAS LIKE TO USE WITH GOOGLE MAPS.
I PLAYED WTIH THE CODE IN ORDER TO TRY OUT DIFFERENT INTERACTION STYLES. I ALSO MADE SMALLER INCREMENTAL REFINEMENTS.
FOR INSTANCE QUICKLY CHANGING PANORAMAS CREATED A FLICKERING EFFECT.
TO STOP THIS, IF YOU MOVE THE MARKER QUICKLY IT GOES STRAIGHT TO A NEW LOCATION.
OTHERWISE, IF YOU MOVE SLOWLY, THE MARKER SHOWS EVERY IN-BETWEEN PANORAMA...
...AS IF SLOWLY WALKING.
OLD MILITARY RD
TRYING OUT INTERACTIONS.
ESCRICK
MEANWHILE...
GREAT EVERYTHING WORKS. NOW WHAT SHOULD THE MARKER BE LIKE?
I COULD BORROW FROM MAP TOOLS THAT ARE ALREADY FAMILAR TO MOST PEOPLE.

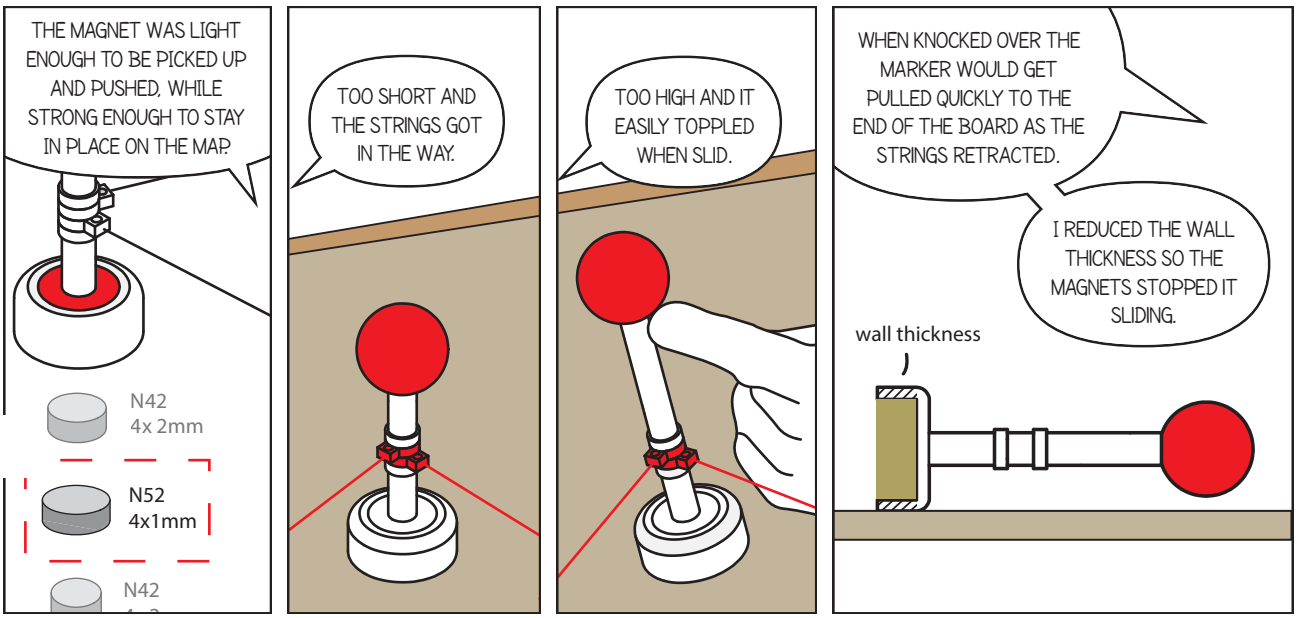

LARGE WASHER RINGS
MARKINGS ON ETCHOGRAPH

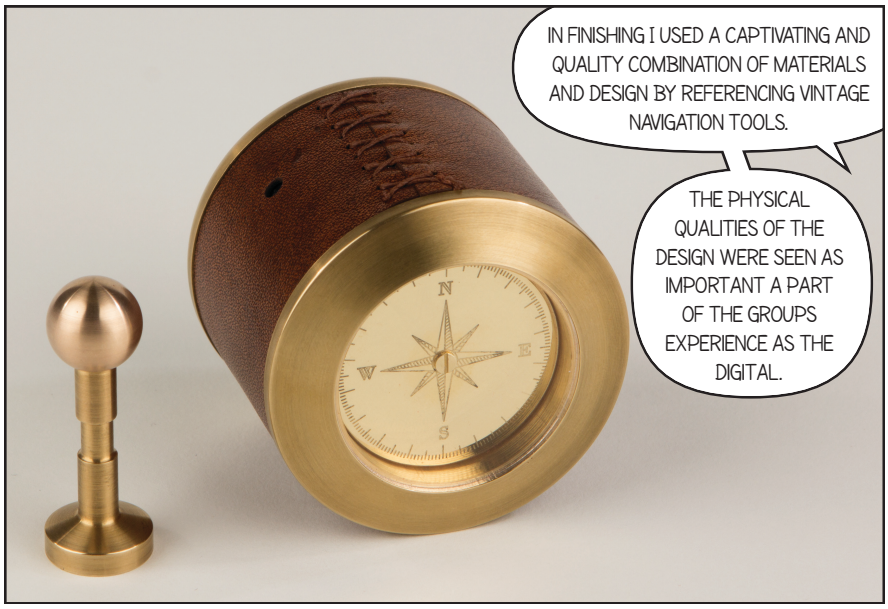


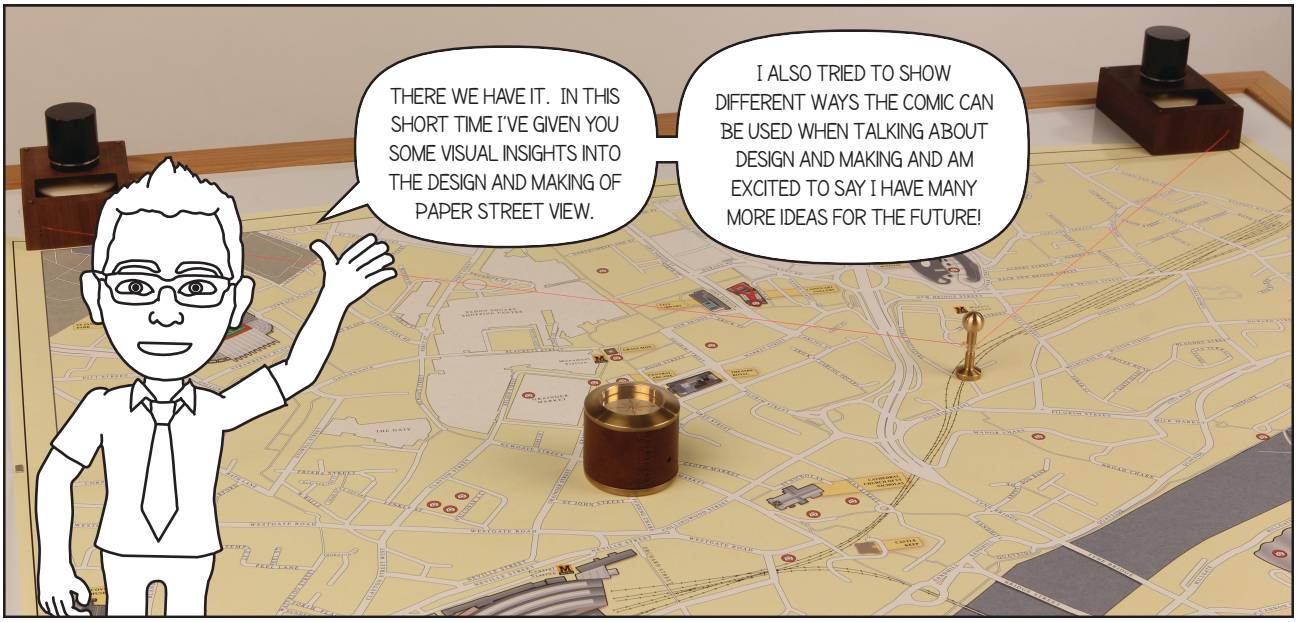

CATHERINE ST


AT THE SAME TIME AS EXPLORING ON PAPER I WAS MAKING PROTOTYPES TO UNDERSTAND WHAT IT WAS LIKE TO USE.
THE LARGER RINGS TENDED TO SNAG AS THEY WERE SO BIG.
TO MAKE THE RINGS SMALLER AND THE MAP MORE VISIBLE I REMOVED THE VIEW FINDER.


IT''S A LOT LIKE A COMPUTER MOUSE.
IT WOULD BE EASIER TO PICK IT UP.
WHY DON'T I TRY A MAGNET AND MAKE A BOARD GAME MARKER.
I CAN STILL HAVE A SURROUND AVAILABLE IN CASE PEOPLE FIND IT EASIER.
magnet
The Bungalow
Anwoth Annexe
Bridge House


THE MAGNET WAS LIGHT ENOUGH TO BE PICKED UP AND PUSHED, WHILE STRONG ENOUGH TO STAY IN PLACE ON THE MAP.
N42 4x 2mm
N52 4x1mm
N42
TOO SHORT AND THE STRINGS GOT IN THE WAY.
TOO HIGH AND IT EASILY TOPPLED WHEN SLID.
WHEN KNOCKED OVER THE MARKER WOULD GET PULLED QUICKLY TO THE END OF THE BOARD AS THE STRINGS RETRACTED.
I REDUCED THE WALL THICKNESS SO THE MAGNETS STOPPED IT SLIDING.
wall thickness


IN FINISHING I USED A CAPTIVATING AND QUALITY COMBINATION OF MATERIALS AND DESIGN BY REFERENCING VINTAGE NAVIGATION TOOLS.
THE PHYSICAL QUALITIES OF THE DESIGN WERE SEEN AS IMPORTANT A PART OF THE GROUPS EXPERIENCE AS THE DIGITAL.


THERE WE HAVE IT. IN THIS SHORT TIME I'VE GIVEN YOU SOME VISUAL INSIGHTS INTO THE DESIGN AND MAKING OF PAPER STREET VIEW.
I ALSO TRIED TO SHOW DIFFERENT WAYS THE COMIC CAN BE USED WHEN TALKING ABOUT DESIGN AND MAKING AND AM EXCITED TO SAY I HAVE MANY MORE IDEAS FOR THE FUTURE!

References

1. Bill Gaver and John Bowers. 2012. Annotated portfolios. *interactions*, 19 (4). 40-49.
2. Nadine Jarvis, David Cameron and Andy Boucher. 2012. Attention to detail: annotations of a design process. *Proceedings of the 7th Nordic Conference on Human-Computer Interaction: Making Sense Through Design*, ACM, Copenhagen, Denmark, 11-20.
3. Scott McCloud and Bob Lappan. 1994. Understanding comics. William Morrow, New York.
4. Thomas Dylan, Mark Blythe, Jayne Wallace, James Thomas and Tim Regan. RtD Comics: A Medium for Representing Research through Design. *Proceedings of the Designing Interactive Systems Conference*, ACM, Brisbane, Australia.