# work on PASSAGES

**céline coutrix**, e.n.s.i.m.a.g. second year internship

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**eleven weeks** from **july the twelvth** to **september the twenty-fourth** in **two thousand and four**

**forewords**

This document is the description, from the concept to the materialization of a first prototype, of the research process on an artistic project called PASSAGES lead by Joëlle Bitton in the Media Lab Europe and in which I took part, as an intern in the human connectedness group.

PASSAGES is ambitious and complex in its concept as well as in its implementation. The conceptual ambition of the project is to put urban people in front of their need for encounter. The title itself, "PASSAGES", regarding to its multiple connotations, is a deep and complicated introduction to the complexity of the idea, even if anybody has experience it somehow unconsciously in everyday life.

During this internship, my aim was to enjoy my work, by having a proper thought about the concept, and then trying out different meaningful ideas and solutions. We decided to present a usable system at the 23rd of September, for a kind of open house event.

I really would like to thank Joëlle and Stefan, head of the Human Connectedness Group, for giving me this opportunity to work on such a thrilling project.

# Contents

# Chapter 1

# context and purpose

## 1.1 context

In order to understand the whys and wherefores of this project and to shape the system in a appropriate way, it is essential to define the space where PASSAGES will be installed, as well as the potential users.

A privileged space where PASSAGES would be installed is a passageway, rather than a street or anywhere else, because this kind of place has a particular status that I am going to explain quickly. PASSAGES is a *situated interactive system*.

Attempting to define separately the space context and the typical users is hopeless: both notions are inextricable. Even the term *passage* means the architectural space — arcade —, as well as the user's actions in the space — passage. The interface aims at being put in such a urban *passage* — untranslatable French word. Hence, users would be all random passers-by or wanderer, but one will define them more aptly with the French term *flâneurs*.

### 1.1.1 arcade

As the word itself has many possible definitions (see appendix A), the physical and architectural context of PASSAGES has different facets. Because a superficial understanding of the arcade's space is not enough to have relevant ideas about the coming interaction design, these notions need to be highlighted with a further definition of the arcade. We will focus mostly on the Parisian arcades, because they were thought as an archetype of the arcade, and were basis for a plenty of analysis — from Walter Benjamin, Charles Baudelaire, the Surrealists,...—, so that we can understand it easier. I will begin with a general characteristics, like its origin, the commodities, and its decline, and then I will explain further the important most characteristics for this project.

#### passage, history

The arcades — their architecture and their function — exists because of economical facts. The metal architecture and the textile business increased in the nineteenth century. Construction exploded — 80 Arcades were built between 1820 and 1840. Key elements stay relatively fixed: the importance of ironwork and glass — glass roof —, technical innovations that made the arcades possible, as much as they did the Crystal Palace or the Eiffel Tower. Modernity was also associated with gaslight, plush fashions, and the slow pace of *flânerie* in the crowded streets.

Figure 1.1: passage Verdeau, Paris [1]

### passage, commodities

Like a public interior, you could find everything you need to rest, to eat and drink, entertainment,. . . "a world in miniature"[2] as Benjamin would say. Boutiques are grouped together in one place. Not only is the arcade emblematic of the fast growing consumer society and the capitalist utopia, but it is also a space for things such as the furtive pleasures of prostitution and gambling. All these things catch attention, and are like an illusion that you could find what you need (see section about the *flâneur*).

### passage, finitude

*Passage* could mean passage of time, from the beginning to the end.

The passage inscribes in the act of its naming the transitory nature of its existence, and points necessarily to its own demise. Some activities — shopping, gazing, strolling, and illicit activities, among many others — participate in the demise of the passage and the rise of the mall. Last but not least, it could not overcome other developing system of circulation: railways, boulevards, highways,. . .

### passage, ambiguous space

**arcade and localization:** First definition of space given by Foucault [3] is localizations, made by exclusive binary relationships, like city vs. country or sacred vs. profane, and why not inside vs. outside.

Arcades used to be a closed space, i.e. earliest arcade in the Palais Royal was a three-sided enclosure. The arcade is a more intimate, narrower space — between buildings — than the large and vast street built by Hausmann: that is why one speak about the *salon* and *boudoir* quality of the passage. The *salon* and *boudoir* terms conveys the ideas of an intimate room, for receiving, entertaining or gathering, and feminine fashion and style, like a public interior. Thus, a passage is a kind of inside.

But it is an open space as well. Passages could be defined as only two-sided enclosures: Two

walls, a transparent roof at most, an entrance on one end, an exit on the other end, open to the city streets. Thus, a passage could be defined as an outside.

The arcade's ambiguity is based on inside vs. outside, closed vs. open, private vs. public.

**arcade as extension of the city street:** After astronomy discoveries, people became conscious of the infinite outside world. Then, "a thing's place becomes a point in its movement", and "A thing's rest become its infinitely slowed down movement"[3]. A localization becomes an "extension" of itself within this understanding of space. Now we can figure out a new understanding of the street, Galileo's "infinite and infinitely open space", and the arcade. The arcade is a continuation of a street.

Because a passage is not a street yet, nor longer a street, the passage is a street extension.

But we can see the arcade more as an extension like a phantasm of the street. Arcades are experienced as interruptions within streets, safe from the traffic, the rain,.... Then if the arcade is an interruption, it could not be an continuation anymore.

**arcade and urban network:** A site is defined by "relations of proximity between points or elements"[3], like trees or lattice — *treillis* in French. Then the space's system becomes "relations among sites"[3]. No place exists in a void and all places are inextricably a part of the relation of all sites. As a "passing place", a passage would be a relation between two sites. Is this sense, a passage could be a "placeless place"[3].

Because a passage is used to go from a place to another, the passage is a relation between site (see appendix **??**).

### passage, transition

A passage — *passageway, (path of) transition, transit, passing, walkway, alleyway, move are synonyms* — is a transitional space between two parallel streets, like an arcade. An arcade binds two streets together in the city. You walk through it to go from one street to another. *Passage* comes from the French word *passage* which means change over, crossing, gangway, gorge (narrow pass), move, pass, passage, passageway, pass beyond, passing, passing through, path, transit, way.

It means changing location as well as moving so as to change position, as of a body part (non-translational motion). That is being in a state of action.

That conveys the ideas of mobility, motion, velocity, movement, transition, circulation, change, activity, energy, changeover, transmigration, displace, go, run.

### passage, trace

"Ephemeral", "fleeting", "passing" — these are adjectives frequently cited as markers of urban modernity. The act of walking in urban space, leaves a trace, to remember. This trace is conceived after the fact, as substitute for the act itself. The trace left behind is substituted for the practice in people's mind.

A trace is readable like a text. Just as language is severed from the world, representations of space are severed from the material spaces and the spatial practices they supposedly reflect. One assumes that he can know the meaning of the urban space that surrounds him, but discovers that he himself has constructed both a meaning for that space as well as that space itself. The missing person vanishes with a trace, but with a trace that ironically leads nowhere.

The trace comes always after the fact. Our contact with space is always second-hand; it is always a representation.

### 1.1.2 *flâneur*

It is not relevant enough here to define the user by his knowledge on interactive system: it could be from ignorant to expert, because he is any random passer-by. Actually, the user must be considered as a completely beginner in using this kind of system. An aptly definition of the wanderer can be found in many literary works, such as Baudelaire or the Surrealists. Without ignoring all these works, we must try to do a timeless sketch of the user, through the following scenario.



He wanders in the city — *passer-by, onlooker, bystander, idler, wanderer, stroller, window shopper, street gambler, gazing person are synonyms of* flâneur —. He plays with the circumstances. He lets the crowd lead him, in order not to choose, although he pays actively attention to the crowd. He just does not want to finish his walk, and wants almost to get lost.

The arcade, as the place for fashionable goods in luxury boutiques, are bound with Baudelaire's observations of modernity, that is, his exploration of fashion and the accelerated and unexpected variety of the quotidian appearances and occasions.

The wanderer watches with no aim. He looks around for anything, for somebody else, against loneliness, for relationship. He looks for a short instant of happiness. And suddenly, he meets someone's look, identifies himself with an anonymous face. They are stranger for each other. "Nos yeux se renvoient la lumière, et la lumière le silence, à ne plus se reconnaître, à survivre à l'absence"[7]. What prevents him for asking for her name? He does not care about this name. Does the relationship need a name to be true? No end in his research, he keeps looking for something, for "toute chose vivante, toute chose immédiate, toute experience voluptueuse, toute experience réelle en général, dont on ne sait jamais auparavant d'où elle vient ni où elle va."[8]

He is looking for something lacking that he will never find — *Freud*. The city changes and lets the traces fade away. That is why the city could not be familiar to the one who wanders.

Because every passers-by are not similar, they are not all wanderer. The targeted user is not only this kind of wanderer, but everybody passing, even the one who is not curious about the urban landscape. The point to highlight this behaviour is that we would like to recall this one, that everybody has known.

## 1.2   purpose

**In a word: The purpose of the installation is to allow passers-by to experience wandering in a passage in a challenging way.**

The main purpose is building an **intimate interface** in this context and for these users. But in this context, building an intimate interface could be done by making it being a part of the space, so that the system reflects the sensibilities of the users. But this could mean putting a sense of intimacy in the system, that is making it intuitive, or also allowing people to have a intimate connection with others through the system.

### 1.2.1   space

"A work is not put in a place, it is that place"[10] said Carl André. Because we want PASSAGES to be an intimate interface, we want it to form a part of the arcade. Hence, it must be composed of the whole surrounding made with the arcade itself, the sensitive space — visual, sound, tactile—, and performers' actions, as "John Cage [...] attempted to experience sound, space, and movement simultaneously, with no distinction between the work and the people who filled the space."[10]

Because then, the only reason for the viewers to experience something is the surrounding space, its atmosphere and their mood; more than because of the device itself. The possible materials — screens, speakers,... — aim at not being seen for themselves in the arcade. Thus, the constructed space — contrary to the natural space, the arcade — is the new dimension implied by the interface. If the audience wants to experience the piece, they would have to interact with it. Then, the experience of the constructed space is almost exactly the experience of the piece, and the viewer could experience the constructed space by her natural activity in the space: passing, in an active way. This would be an interface intimate with its space.

One experiences the space through the body — the space is even made with the body —, and we want the user to be able to "experience both the body itself and the space in which it moves."[10] That is, experiencing being in a passage is more experiencing passing and wandering. We want, with PASSAGES, to reveal this space in which it operates to the sense of the public. Like in Trisha Brown dance, where we can find a "direct space experience, using existing buildings and obstacles to be overpowered through physical effort"[10], this installation uses the existing arcade. But it would allow performers, not to change their experience with these existing buildings, but to become conscious of the relationship they have with them as they pass through. So, we aim at using passing in interaction.

In a word, PASSAGES aims at capturing the essence/spirit of an arcade, which is a specific place, and belong with it, in order not to change its essence. PASSAGES would rather enforce the reality of the space, without altering it. It is like recalling the essence of passage with the installation.

We want to recall these notions:

**passing** We want the user to pass through the interface, because it is going to be the passage itself: because the space convey the idea of movement and passage, we aim at letting the user moving and passing. Moreover, we want them to have a full body moving experience.

**being attracted** We want to suggest to the casual passer-by that there something to look for in this space, as well as in the natural arcade, by attracting them by things or trace, or even by people in a passage.

**having a contact with people** This kind of distant and conniving relationship has to be triggered in PASSAGES, so that we can even convey a sense of presence over a distance, and have a feeling of intimacy and closeness, and trigger the encounter they are looking for.

**leaving a trace, reading these traces** Also as leaving a trace is something that happens in the natural space, we want a notion of trace and memory in the installation, even remembering or keeping an artefact as souvenir.

### 1.2.2  intuition

As PASSAGES would not changed the essence of the arcade, it would use the performer's intuition and her natural behaviour to let him perceive what she is actually doing. We must take care about the intuition and the understanding of the system.

The *flâneur* may have exactly the same feeling of space in PASSAGES than in an arcade. By approaching a shopping window or the interface, she performs the same action — something must catch her attention. By avoiding a person who stand in front of him/her in an arcade or in front of the interface, or by glancing at this person, she would perform the same action. By listening to voices and sounds, or by making sound by herself, she will have slightly the same behaviour. By playing with an unknown silhouette, she will enhance her relationship with this stranger.

But on the other hand, it would not be wishable to have an ideal and fully intuitive installation, so that the user does not even realize that he is using it.

### 1.2.3  relationship

The point to speak about the architecture is that this architecture create a space for the relationship, in which we are interested. As explains RoseLee Goldberg, "for Graham, the particular interaction between individuals, their action in public and private space, and the constructed spaces, made the pieces more "architectural", in the sense that architecture implies these relationships"[10]. We just said that the installation aims at being part of the architecture. But if PASSAGES could reveal the relationships between performers, PASSAGES would reveal the architecture. This let us begin gradually to talk about the relationship.

We want to give the *flâneur* a new opportunity to experience this kind of real, immediate relationship, without any intention or aim while wandering, and connect users with each other whether it is pleasant or not.

This kind of relationship is possible between two strangers, sharing a sense of intimacy and closeness by getting closer, like in the subway or in an overcrowded street, because of the pressure of the crowd, or also by having eye-contact,... and this could make the passers-by ill-at-ease.

But actually, the space within the installation aims at letting people coming into contact with each other, while being conscious of their already existing behaviour. Now, like in Bertold Brecht's works, "self-consciousness and uncomfortable state should be imposed on the audience/performers, in order not to alienate audience and performers"[10] (see 1.2.2), as a passage is a ambiguous public-private space. The gap between intimacy and closeness, and urban transitional space, allows them

to realize what they are experiencing, as putting them in front of people who have exactly the same activity elsewhere.

Moreover, because people are looking or waiting for something, for this kind of real and immediate relationship, it makes them closer because of their common aim. We can show them that way that they are not alone in this immediate research for contact, so that they can feel a presence. This kind of interaction we want to trigger between people is more about distant-intimate contact. Distant because they are strangers and consequently do not know each other, and intimate because they both know that they have something in common, something to share, whereas their distance do not allow them to do it properly. That is why we want them to feel close to each other, but remind strangers as well. Our aim is to build a kind of playground where they can experience this intimate relationship without trying to make anything else but strangers.

# Chapter 2

# preceding works

No project have exactly the same aim as PASSAGES. Nevertheless, because PASSAGES is not isolated from other projects, we need to be aware of every quality or drawback of the existing works, in order to learn from them and make something different. Some of the following works are nice, cute, fun or amusing, but we have to wonder if it is anything more than decorative or entertaining. Each of them inspires something on a particular level of the interaction that PASSAGES would have, given the context — users location and activity. We will always ask this question: How could they help to answer properly to PASSAGES' purpose defined above?

## 2.1   catching attention

This will be a very short analysis, because very few projects focus on this part of the interaction. Yet, in an urban context, it is one of the most important design question we must ask ourselves. Both "access project" (see B.1) and "lignes mobiles" (see B.2) take care of it. They use a projection on the floor, which target is particular people. We must remember that they go to get the person, more that trying to make her come.

   We can also refer to neon lighting in cities' streets and some advertising techniques, that aims to catch attention.

## 2.2   dare, come and feel

Some interesting works try to make their interface more intimate, by focusing on the sensation you can have if you make the effort to come closer. They try to let you, as a spectator, have a certain type of activity so that you can feel something unexpected in front of a computer system.

   Among these projects who try to trigger a sensation are "bump" (see B.3), "sleep" (see B.4), "wave rings" (see B.5), "beatrix", "big beatrix junior" and "forty part motet" (see B.6), "zone_01" (see B.22), "tenuous" (see B.7), Mark Rothko's paintings (see B.8), and "MirrorSpace" (see B.9).

   Most of them let the user come in an intimate distance to the interface, as far as she can touch it. Most of the sound works play with the spatiality of sound and vibrations.

## 2.3   self awareness

Among these projects which focus on self awareness are "11th and flower" (see B.10), "bridge 2000", "waiting signal", "stairs" and "tunnel" (see B.11), "hubbub" (see B.12), "frequency and volume" (see B.13), "fotron2000" (see B.14), "circulez y'a rien à voir" (see B.16), "impression" (see B.18), "access project" (see B.1), "telemurals" (see B.19), and "co.incide" (see B.20).

How can you feel yourself in the interface? We can find two main tendencies: a realistic and faithful image like a mirror vs distant or non realistic work, which follow your movement: that is mirrorSpace,... vs. fotron2000, telemurals, impression, co.incide, and most of sound works.

With "11th and flower", performers could see their impact at a distance via a video display.

## 2.4   movement within a space

This part of the project is one of the most important, because of the passages' essence, that is *passing*.

These projects found different ways to represent the movement: "sonic city" (see B.23), Marey and Muybridge's works (see B.24), "nude descending a staircase" (see B.25), and futurists' works (see B.26), "i:move" (see B.27), and "depletion" (see B.30).

"depletion" is an accumulation of movement. On the contrary, most of them follow a cinematographic approach. And finally, some represent the propagation of a "wave" ("dynamism of an automobile"). "Sonic city" has a different approach: they worked with some of the movement's characteristic familiar for sound (periodicity, rhythm, repetition, ... ).

Other projects try to encourage the mobility "compliant" (see B.17), "the way you walk"[33] and "Circulez y'a rien a voir"(see B.16). There, the movement is triggered with the installation.

## 2.5   perceive the other and the world

The simplest way for this perception is to work like video-conferencing, even augmented with tactile force or non realistic visual rendering — "hole-in-space" (see B.31), "hole in the earth" (see B.32), "world/world" (see B.33), "telemurals" (see B.19). Those which make an intimate and privileged connection between you and the other — "bodymovies" (see B.35), "lignes mobiles" (see B.2), and "co.incide" (see B.20) — are closer to our aim. But unfortunately, they often lack of closeness to enhance intimacy. "MirrorSpace" (see B.9) make users close to each other, but don't use the entire body, so that the movement is not important in the interaction.

## 2.6   encounter and elaboration of relationships

Among these projects who try to focus on the relationship, so that the work could be more than amusing five minutes long, are "hole-in-space" (see B.31) — because once the work became famous, people who did not meet for a while used the installation to the see each other —, "concentration" (see B.34), and "resonance of 4" (see B.36), which try to make people acting, be engaged in an activity together.

## 2.7 trace

All the work dealing with trace are interesting for us, even more if the trace fades away, like in a passage or a street, but also if the traces is going to stay longer.

Among this kind of work are "depletion" (see B.30), "artifacts of the presence era" (see B.28), "i:move" (see B.27), "impression" (see B.18), "fotron2000" (see B.14), "liquide time" (see B.29).

All these work are different, but have in common that they work on the visual trace at least, often dealing with movement.

# Chapter 3

# design

The installation were — and is still — designed step by step, as long as we began to work on the software part. Mostly to have the opportunity to experiment as the same time, so that design errors could be avoided soon enough. However, I will try to describe the choices made, given the purpose and what we learnt with the existing works.

## 3.1   catching attention

As the target is any random passer-by in a public space, making him or her participate is the main difficulty.

Even if we would like to free the interface of the traditional screen, we finally came back to it, but with the idea that the screen will be more a full interactive surface than a traditional screen. Then, like a shopping window, the screen aim at attracting people in the same way:

- choice of screen material and fabric —Indeed, the textile part is a symbol, because of the passage's history of textile trade. Horizontal fabric conveys the idea of passing, vertical fabric conveys the idea of full body. Moreover the volume made by the two fabrics let think that there could be something behind.

- trace of preceding interactions to be read on the interface,

- projection on the floor, which aim at getting the passer-by who do not pay attention to the landscape,

- Projecting silhouettes of passers-by on the wall —the screen, which is temptation to the encounter.

Because these propositions are not exclusive, we can think about all of them together.

## 3.2   attraction and sensation

Once we caught the user's attention, we aim at putting the user from a public distance to a intimate one, or at least personal, taking the *proxemics*[11] into account. That is why we want her to come closer to the interface, and look for something, be able to use most of his sense like touch,

sound,…to feel that something is happening. We want to use as much human sense as possible, including touch.

- The fabric could be a tactile temptation. As we want to project on, we need a white or at least bright fabric, and thick enough to do a rear-projection. Moreover we want it to have interesting tactile characteristics. And we do not want it to attractive when the user is close, because it is not the main part of the installation.

  We chose to build the first prototype with two layers of fabric, so that the volume made by them take part in the tactile sensation. We chose a calico and a kind of canvas on it.

- Even if the sound aspect of this installation will be later more precisely design, one already thought about putting speakers in the screen. Then we can touch them and have tactile-sound feeling.

- The visual interaction starts as soon as the user is close to the interface. But in the future we can imagine something more gradual, like mirrorSpace (see B.9).

Touch, sound and traces of a later interaction could all play the role a an attraction toward the interface.

## 3.3 self perception

First of all, if we think objectively about the interface, we cannot design the world perception and the self perception apart from each other. Indeed, as we want to design an intimate interface, the tool for the interaction with the world must be deeply bounded to the user self perception. We always kept this in mind in the following paragraphs.

- PASSAGES could connect two different arcades in two different cities. And feeling what is similar between me and this person elsewhere make me think about what I am doing. Hence it take part in self-awareness. But of course the purpose is also to trigger the encounter (see 3.4).

- user representation

  There is a lot a possibilities to represent the user on the interface, from the mirror image to the plain silhouette or the only outline.

  The feeling of oneself in the interface for this project should be ones entire body as an door open to the interface, as a consequence of the presence. If I am here, then I know that something is going to happen in me.

  We adopted as a visual model *La Linea* (see figure 3.1). We don't want the screen to be a mirror, that is why it is not necessary to draw superfluous details. But we want the image to be as close a possible to the user, and the user body could fit perfectly in its contour. By drawing the contours this way (thick line), there is a slight cartoon effect. This drawing is me, I can control it, but this not properly *me*, so that I can behave safer.

  Moreover, displaying the entire body on the interface make users conscious of their own body.

Figure 3.1: La Linea

## 3.4   world perception

- PASSAGES will connect two different cities, so that the relation between self and other is questioned.

- We could display the realistic image of the other, in order to see each other reactions, but this raise a technical problem (see 3.8.2). We need information on the other feelings, expressions, so that a plain silhouette could be not enough. We can compare this representation with a face as an interface for interpersonal communication. We are conscious that our face is where the information about feeling or mood go through. On the one hand, it is open, even if we do not want to. But on the other hand, we are able to control it in a way, and something of ourselves remain hidden from the other. That is why we must not show everything to the others in this system.

  So, maybe we don't need to display a realistic image of the other, but capture features, to get round the technical problem.

- A nice way to make the perception of the other more intimate and let the relationship begin close is to let the users fit together the two silhouettes, in a most sensual way, by drawing the local contour and the remote image within the contour.

- Moreover, even if the sound work was not developed at this point, different ideas were thrown. For instance, a sound silhouette is a speaker which produce a sound when you stand on the other side in front of the corresponding micro, and the others are mute.

## 3.5   mobility

How can the installation render a particular feeling of movement, mobility, transition, changes?

- full body sized screen, displaying users entire body,

- sound and/or visual impulse to move,

- trace of the movement — if moving means "drawing" on the interface, it could be also an impulse to make the user moving.

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## 3.6   encounter

A musical work could be imagined, like the more time people spend overlapping their body, the more developed the sound is.

This part of the design was at the very beginning when I left the lab. That is why I cannot really describe the ideas.

## 3.7   trace

We need to leave a clue that something has been present, like a drawing creating by tracing. We chose to draw the course of the user along the interface, like a subtle ghost which can follow the user silhouette. But we could have projected footprints on the floor, or leave a shot of an instant on the wall.



Figure 3.2: trace of an hand wave (see software part)

## 3.8   constraints

### 3.8.1   originally

Finally, the installation aims at being in a urban and public space. Hence, the choices we made had to be realistic and liveable in this environment.

No additional device could be wore because a user must be any random passer-by.

### 3.8.2   afterwards

**second camera's placement**

Where to place the camera capturing people's faces and bodies? How getting round the problem?

An idea was to divide the screen in stripes, the pair ones for the projection and the odd ones for capturing an image, for instance. But this idea was not experimented yet was I left the lab.

**projection**

We could project only within the silhouette — or maybe something very subtly light —, because we needed a white background (see 4.2.2).

# Chapter 4

# software

## 4.1   programming language

I chose to use Isis [50], among c, c++ and a plenty of multimedia languages.

   The reason why I chose Isis is that it was made to do image processing, so that it could be easier and quicker in the task I must do. Moreover, Stefan is one of the author, so that it might have been easier to find answers to my questions.

   If you go deeper in knowing Isis, I should tell that I used mainly the image processing library and the macaroni library to write OpenGL code in a more efficient way. But because all I needed was not implemented in this language, I wrote c code as well. And actually, Isis is easily extendable, and also often extended! I wonder whether it is good or not.

   The visual sensation is not the only one human can have. So the main regret I have about Isis is that it is not complete concerning sound processing, which is important in the future of PASSAGES.

## 4.2   image segmentation

Once I got started with Isis, it was time to think about body detection. From the video image I captured from the camera, I wanted a binary image, where the silhouette is white for instance, and the rest is black.

   Because in a short term —in the M.L.E. open house event on the 23rd of September and later perhaps between the MIT Media Lab in Boston and the M.L.E., PASSAGES would be installed in a controlled illuminated surrounding, I do not need any slow and complex segmentation algorithm.

   Moreover the better image we can capture, the easier it could be to find a body. That it why we thought about a different approach so that the body tracking could be easier, even if we did not find any clever idea[49]!

   I decided the value of the threshold in an experimental way, because the lightening condition would not change. So since I fixed a value for the threshold, the value remain the same.

### 4.2.1   infrared

Even if we did not have any good results, it could work, because there are references of works made this way[48]. I think that the decision to use the infrared installation, was made to soon. I did

not know any references about scientific studies on *full body* tracking with infrared. I could have helped to know what kind of installation we needed.

- We had not enough light, but the infrared beamer is expensive enough — a few hundred euros — not to order more than one of them, given that the group was running out of money!

- We tried 2 filters: one was made of plastic, which is cheaper than glass, but worst; the other one was hand-made by Hannes Nehls from liminal devices research group, and was good at seeing the IR rays, but tiny stripes were causing a low quality image.

But the ratio between the noise and the brightness I could have on the binary image was not convenient enough to keep working in this direction. That is why I started to work on the "dark body on a bright background" idea, which is slightly different.

### 4.2.2  colour

To find silhouette in real time, we had to do it quickly. A simple threshold operation could be enough, only if the background is perfectly bright. Hence we need to have a white fabric (see constraint 3.8.2 on the installation).

We must manage to find a compromise between noise and details. But as you can see the binary image is convenient enough.



## 4.3  contours tracking

Once we have a clear binary image with silhouette, we can think about contour tracking in the local image.

### 4.3.1  edge detection filter

This way was inconvenient because of a lack of precision and clarity. Of course we could add other processing afterwards, but it would be too much compared to the following contours tracking method.

### 4.3.2 OpenCV

The Open Computer Vision library already implements the contours detection, approximation, etc., and Isis has been extended — but not fully tested — to use OpenCV. Because everything was already done, I was tempted to use it. The first (and last unfortunately) difficulty was to install OpenCV on the computers. As I had no idea about what I must do after reading the INSTALL file, I was afraid of spending to much time on it.

This the one of the main regret I have about the software, because I could have been very useful. But sometimes it is difficult to make the decision to take a chance. I decided to rely on myself.

### 4.3.3 simple

Let $I$ be an image. $I \in \mathcal{M}_{m,n}$. $I = (P_{i,j})_{\substack{0 \leq i \leq m-1 \\ 0 \leq j \leq n-1}}$

Let $\mathcal{C}$ be a inside contour. $\mathcal{C}$ is made of $\mathcal{V}$, set of all vertical segments, and $\mathcal{H}$, set of all horizontal ones. $\mathcal{C} = \mathcal{V} \cup \mathcal{H}$ and — if the foreground colour is black (0):

$$P_{i,j} \in \mathcal{V} \iff (P_{i,j} = 0 \wedge P_{i,j-1} \neq P_{i,j+1})$$

$$P_{i,j} \in \mathcal{H} \iff (P_{i,j} = 0 \wedge P_{i-1,j} \neq P_{i+1,j})$$

This very simple algorithm is actually enough to get an outline. I had problem with concave corners, were the inside pixel is not detected. This is inconvenient for the viewer. But as we wanted to have a thick line, this problem had no consequences on the final image.

I would like to say that because I worked on an half-sized image, the projection on the fabric was "pixellised". One way to get round the problem was to draw the thick and smoother points thanks to OpenGL.

### 4.3.4 contour following

I did not developed it as far as I could, because the network part had to be done soon. Indeed, I wanted lo leave the lab with a basic system at least. Then if I got time, I could have added something. (The way I began to do it is in appendix C.)

This way to find the contour could have been useful if I could stay in Dublin to work on the visual rendering, that is classify each contour and follow each of them in the video stream, make approximation in the shape,...

## 4.4 network

Now it is time to melt the distant images, because want to see the remote image within the silhouette

I spent actually most of my time working on software on the network synchronisation. As I hardly knew before what "socket" mean and I had not much help because Stefan was in Ars Electronica and vacation. So I had to take the least chance I could. I worked with "morphing" techniques. I started with the very simple server/client example on the Isis web site, and gradually understood and manage to complete the final software.

Figure 4.1: outline

I used a client/server model, in a synchronous mode of communication.

| server machine | | client machine |
|---|---|---|
| listen to connection request | | |
| | | open tcp connection to server |
| accept connection | ╱ | |
| loop for ever: | | loop for ever: |
| send | ⟶ | receive |
| receive | ⟵ | send |

## 4.5   closeness detection

How could the system be triggered, how can we know that the user is close enough? with camera, lazyfish sensors, foot switches[1]?

The last idea was the most realistic one. When I left the lab, I was trying to make the footswitch working well.

---

[1]Footswitches need to be hidden by a carpet, otherwise the users dare not step on them.

Figure 4.2: final image

# Appendix A

# passage's definition

**passage** *n.*

1. The act or process of passing, esp.:

    (a) A movement from one place to another; transit.

    (b) The process of elapsing.

    (c) The process of passing from one condition or stage to another; transition.

    (d) *Obs.* Death.

    (e) The enactment into law of a legislative measure.

2. A journey, esp. one by air or water.

3. (a) The right to travel on something, esp. a ship: *book a passage.*

    (b) The price paid for this.

4. The right, permission, or power to come and go freely.

5. (a) A path, channel, or duct through, over, or along which something may pass: *the nasal passages.*

    (b) A corridor.

6. An occurrence between two persons, esp.:

    (a) An exchange of words, arguments, or vows.

    (b) An exchange of blows: *passage at arms.*

7. A segment of a literary work: *a celebrated passage from Shakespeare.*

8. *Mus.* A segment of a composition.

9. *Med.* An emptying of the bowels.

# Appendix B

# preceding works

## B.1  access project

Access project [12] (see figure B.1) allows participant to track people in an public space with a spotlight and sound.



Figure B.1: *Access Project*

### B.1.1  interest

Tracking individuals with a unique robotic spotlight and acoustic beam system is more dynamic than a "immobile in front of a screen" interaction.

About perceive the world: The tracked individuals do not know who is tracking them and the web users do not know that their actions trigger sound towards the target: both the tracker and the tracked are in a paradoxical communication loop, and the exact location of the public space is revealed only after ACCESS moves to its next location, so that the two strangers are kept in a kind of unawareness of each other surroundings, trying to focus on the curiosity and misunderstanding in the first step of the relationship. Is it a good idea to add misunderstood?

## B.2  les lignes mobiles

In Lignes Mobiles[13] (see figure B.2) , a video projector projects lines on the floor, both according to passers-by and in an autonomous way, improvised by the computer. The passers-by are first framed by a circle and then the lines appear, which interact with these persons. Sometimes they

emerge, develop connections between the passing people or attach themselves to their heels and then disappear again.



Figure B.2: *Les Lignes Mobiles*

## B.3   bump



Figure B.3: *Bump*

Bump [25] (see figure B.3) is a catwalk installed in the public space of each city involved. When a person steps onto the catwalk their weight triggers an impulse that is transferred into the other city . There, a pneumatic piston raises the corresponding board by a few centimetres.

## B.4   sleep

In the web site [21], sounds of sleep can be downloaded. Then, they explain how to perform sleep: Lay on your back on any appealing surface. Gently position your laptop on your chest. Relax and allow your laptop to press you into sleep with its warmth while sending transmissions to you as you dream.

## B.5   wave rings

Wave rings [22] is a pool (see figure B.4), supported by eight legs, that has eight speakers submerged inside of it, equidistant from one another and butted against the enclosing well of the pool. The speakers' surfaces is covered and waterproofed by a very thin latex sheath. From above, one can see that each speaker is positioned in front of each leg. When a person approaches or passes the pool, the nearest infrared sensor to the person will trigger a speaker to make musical sound, and the vibration of this speaker transforms the movement of the water; tiny columns of water flow and wave rings appear on the surface of the water.

Figure B.4: *Wave Rings*

## B.6    beatrix, big beatrix junior and forty part motet



Figure B.5: *Forty Part Motey*

Beatrix [23] is an drum ensemble installation with 8 self-powered speakers and radio communicating microcontroller nodes mounted on a black panel. The ensemble is composed of players performing coordinated rhythm patterns that together fuse into a parsimonious yet complex interlocking rhythm. the players phases and rhythms are coordinated by radio.

BigBeatrixJunior [24] is built as a matrix of 12 self-powered speakers mounted on a white panel with visualizations superimposed on top with a projector. The ensemble is composed of players performing solos or accompaniment. The accompaniment parts will be simple rhythms composed of limited voices that together fuse into a parsimonious yet complex interlocking rhythm. appropriate accompaniment is determined based on other accompaniments. Soloists perform highly syncopated rhythms that cut across this foundation. They are also able to change tempo, rhythms, and crescendo with agreed on patterns. finally, sensor input will control tempo and allow the introduction of parts and voices.

Forty Part Motey [26] is a virtual architecture of pure sound (see figure B.5): Spem in Alium, a choral work written for forty voices, has a soaring composition structured in overlapping layers. The spatialisation of this complex musical structure transports the listener into a transcendent realm. At the same time it is possible to experience the voice of each performer. Unlike the concert hall, audiences may wander among groups of singers who are evoked as an absent presence, a ghost choir. The experience of hearing voices, of having one's consciousness invaded by someone else's memories and reflections, is at once strangely marvellous and frightening.

## B.7   tenuous

Tenuous [14] examines the heartbeat as a signifier of life and emotion. Stark graphics are combined with rich audio to invert the normal perceptual experience. A visitor is led into a light tight immersive room and presented with an audio/visual wall of ten "disembodied" heartbeats. As the visitor approaches the wall, the heartbeats speed up fearfully. Approaching further leads to a surprise.

## B.8   Mark Rothko



Figure B.6: Mark Rothko, *Untitled*, 1958 (266.1 x 252.4 cm)

He wanted the viewer to move as close as possible to the painting (figure B.6), so that one could see only the painting. That is why his paintings have such a size. By doing it, one could feel the depth of his paintings. He really manage to create a second dimension on flat paintings.
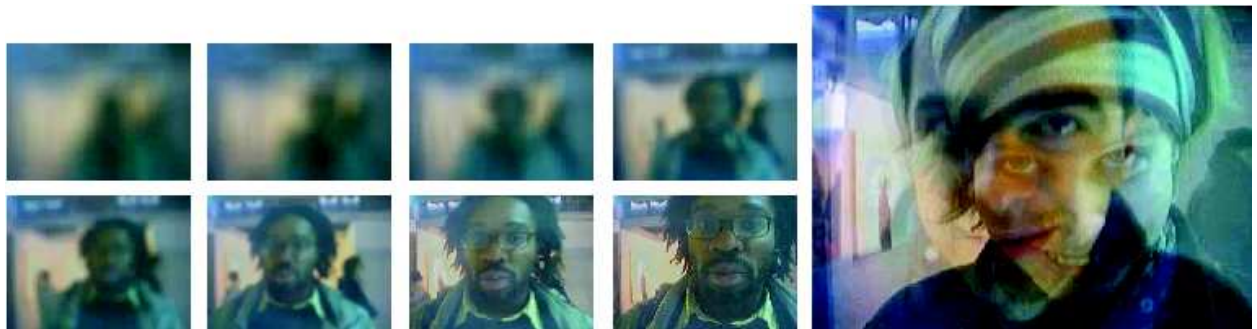
## B.9   mirror space



Figure B.7: MirrorSpace

MirrorSpace [20] (figure B.7) connects remote places, from a blur image for peripheral awareness to a superimposition of the image for close communication — looking into each other's eyes — , by

letting the user moving toward the device — see also B.29 (liquide time) as an attempt to move closer to the interface.

## B.10    11th and flower

This project [27] consists of a luminous field of LED lights embedded into the entry walkway that respond to the presence of visitors, a massive display of lights on the building face that mirror the patterns of the entry, and video displays in the lobby and entry areas. Activities on the walkway also trigger massive light displays on the building face. When the walkway interactivity is triggered users witness their impact on the building face via a video display.

## B.11    bridge 2000, waiting signal, stairs and tunnel

Bridge 2000 [28] is an interactive sound and light installation on footbridge across the Liffey in the centre of Dublin.

Stairs [28] made steps and ramp sensitised. Movement by persons along or across them generated sounds which were made audible by multiple local loudspeakers.

Tunnel [28] is an interactive sound installation in the small tunnel connecting sites. During the day some 3000 persons passed through every hour.

Waitingsignals [29] consisted of eight light tubes that reacted to the movements of passers-by via ultrasonic sensors. If a sensor is triggered for a longer while, one by one all of the lamps will start to pulse in rhythm. This networked light play can be interrupted at any point or time by interfering with another ultrasonic beam.

## B.12    hubbub

Hubbub [30] installations may be built into a bench, in a bus stop, a bar, a cafe, a school courtyard, a plaza, a park. As you walk by a Hubbub installation, some of the words you speak will dance in projection across the surfaces according to the energy and prosody of your voice.

## B.13    frequency and volume

FREQUENCY AND VOLUME [31] consists of projected shadows which allow participants to scan the radio spectrum of the city with their bodies. As a shadow appears it tunes any radio frequency based on its position. The size of the shadow controls the volume gain of the specific channel. The resulting sound environment is a composition controlled by people's movements.

## B.14    fotron2000

fotron2000 [32] (see figure B.8) a robotic sketch artist whose medium is LED light and whose canvas is long exposed Polaroid film. The robot draws quickly, rendering a line drawing of its subject

The user gets the drawing to keep, so that one keep a trace of the experience. interesting non-photorealistic rendering of the image.

Figure B.8: *Fotron2000*

## B.15 the way you walk

"The Way You Walk" invites the spectator to distort pop videos (image and sound) by roaming in front of the space of projection. It is a pop-terrorist installation. The movements of the spectator, captured by a camera are converted into controllers of the speed and resolution of the movies. Each viewer can slowly walk a centimetre at a time, stamp his feet, run forwards, backwards and experiment his own way of distorting, stretching the video sequence in a rough style every time renewed.

## B.16 circulez y'a rien à voir

The installation [33] allows the passer-by to generate images and sounds by his mere moves in front of the projection space.

### B.16.1 interest

The *natural* activity of passers-by generate visual and sound feed-back. Thus, the installation could not change their relationship with the street.

### B.16.2 lack, regret

This kind of visual feedback may be not intuitive enough for PASSAGES (no silhouette) . Moreover the interaction concept does not encourage human connectedness so much, even in the same side of the screen. and finally, their relation with each other may remain distant (neither closeness nor intimacy).

## B.17 compliant

Compliant [18] (figure B.9) creates a projected screen of soft light. As visitors walk into the field of the projected screen, the shadows of their bodies cause the screen to be distorted and pushed away, as if the screen were a rubber sheet. The physical bodies of the viewers become the dominant force in the relationship with the screen, distorting it, pushing it out of its alignment, or completely chasing it out of view. Multiple viewers can impose on the screen from all angles and hasten its disappearance. This give-and-take relationship with the screen also evokes cinema more directly, by recalling the slapstick comedy of Charlie Chaplin endlessly chasing his hat in The Tramp.
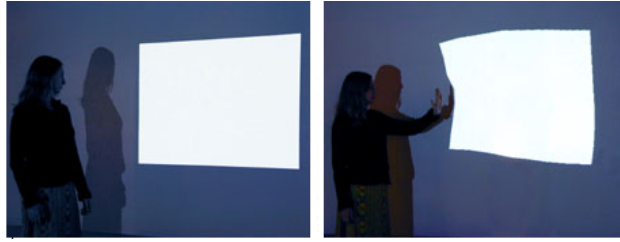
Figure B.9: *Screen Series, Compliant*, Scott Snibbe

Here the body becomes is the force in the interface.
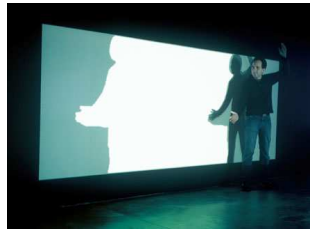
## B.18   impression



Figure B.10: *Screen Series, Impression*, Scott Snibbe

Impression [16] (see figure B.10) preserves the silhouettes of the bodies that move across its surface. As visitors move into a projected rectangle, the profile of their shadow displaces the screen horizontally, so that one side of their silhouette is formed in light along the opposite edge of the screen. In this way, the screen absorbs the forms of the bodies that push against it like clay it holds an impression. After some time without any bodies within the projection, the screen's edges slide back into their initial rectangular shape.

## B.19   telemurals

TeleMurals [34] is a audio-video connection where a communication space is created by breaking apart the pixels and speech of the participants at each end and reassembling them abstractly (see B.11).

### B.19.1   interest

- Image and audio transformations evolve as people communicate through the system by blending the participating spaces. Thus, the system required involvement (movements and speech inflexions) from both users to evolve, more than a simple teleconference.

Figure B.11: *Telemurals*

- Using non-photorealistic images have similarities to virtual spaces in online worlds: putting on a mask and entering an electronic communication space removes many of the social barriers.

- Visual can express non-rational emotions, non-verbal experiences, but using non-photorealistic images might be a good idea: it influences conversation (caricature and cartooning), puts aside superfluous details and enhance others.

### B.19.2   lack, regret

focus more on the behaviour than on the relationship itself

## B.20   co.incide

Co.Incide [35] is a installation with two main interfaces. The two parts are located in different areas and enable the users to communicate with each other, but he sees himself within the intersecting area of his own and the counterpart silhouette and the degree of overlapping controls the volume of the audio streaming. After the two silhouettes matched you can be the other user, you have your silhouette but the "skin" of the other user (see figure B.12).



Figure B.12: *co.incide*

### B.20.1   interest

body awareness, intimate contact with each other, because one has to synchronize its body with the other one in order to talk or to see oneself.

### B.20.2   lack, regret

- One could enhance the intimacy of the relationship by letting a user move close to the screen, have tactile interaction or whatever...

- The users are different (not a passer-by). The installation must be thought for each kind of user, hence PASSAGES should be slightly different.

## B.21   sound mapping

In Sound Mapping[41], a Global Positioning System (GPS) tracks participants as they wheel four movement-sensitive, sound producing which play music in response to nearby architectural features and the movements of individuals.

## B.22   zone_01

Taking place in public space, "zone_01"[42] simulates communicative processes and translates them into sound. The sounds and rhythms generated, which characteristics of rhythm and dynamics resemble the periodicity and phrase oriented structure of speech, are synonymous for verbal communication.

It consists of eight differently grouped sound emitting objects which can be positioned in accordance with the characteristics of the specific location.

The distance of an individual or of several people to the sound sources determines the degree of sonority and the differentiation of rhythmic and dynamic structures. The closer a person stands to the sound sources, the less noisy, and thus the more sonorous, differentiated and periodic the sound becomes.

## B.23   sonic city



Figure B.13: *Sonic City*

Sonic City [45] (see figure B.13) is a project exploring mobile interaction and wearable technology for everyday music creation. They have designed, implemented and evaluated a system that creates electronic music based on sensing bodily and environmental factors. Mapping these to the real-time processing of concrete sounds, Sonic City generates a personal soundscape co-produced by physical movement, local activity, and urban ambiance. Encounters, events, architecture, (mis)behaviours — all become means of interacting with or 'playing the city'.

In this project, their intention is to break out of traditional contexts for music creation to explore creative possibilities within local surroundings and mundane activities. Wearing Sonic City, anyone can experience a simple walk down the street as an expressive act, a path through the city as a personal composition. As a complement to lived urban experience, it is an intimate soundscape intended to enhance perception and encourage new uses of the urban landscape.

## B.24 Marey and Muybridge

see figure B.14.



Figure B.14: Marey and Muybridge

## B.25 *nude descending a staircase*

see figure B.15.



Figure B.15: Marcel Duchamp, *nude descending a staircase*, 1912

## B.26   futurism

see figure B.16.



Figure B.16: Giacomo Balla, *Dynamism of Dog on a Leash*, 1912

another way of representing movement : vibration (see figure B.17).



Figure B.17: Luigi Russolo, *Dynamism of an Automobile*, 1910

## B.27   i:move



Figure B.18: *i:Move*

i:Move [44] is a public space installation projected onto the side of the MIT Media Lab, and one other distal location each night: An interactive video piece that responds to people's movements and layers them against an aggregation of public space activities of the day (see figure B.18)

### B.27.1 interest

understand how people move and how best to represent that visually
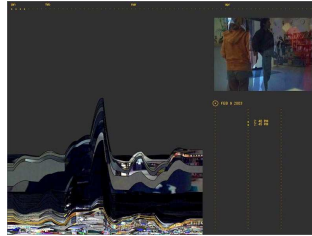
## B.28 artifacts of the presence era



Figure B.19: *Artifacts of the Presence Era*

Like the visible layers of a canyon), witnesses to sedimentary accumulation over time (see figure B.19), the layers in Artifacts of the Presence Era [43] tell us a story of past events. Here, the images and sounds produced in the ICA gallery are captured and then visualized as a growing, organic landscape that serves as a historical record. Like its natural counterpart, this process reveals long-term patterns (the rhythm of night and day, periods of great activity or empty silence), while retaining occasionally serendipitous, but often mundane, samples of the passage of life.

### B.28.1 interest

original way of representing time leaving.

## B.29 liquidtime



Figure B.20: *liquidtime*

In the Liquid Time Series installation [19], a participant's physical motion in the installation space fragments time in a pre-recorded video clip (see figure B.20). As the participant moves closer to the projection screen they push deeper into time — but only in the area of the screen directly in front of them. Beautiful and startling disruptions are created as people move through the installation space. As viewers move away, the fragmented image heals in their wake — like a

pond returning to stillness. The interface of one's body — which can only exist in one place, at one time — becomes the means to create a space in which multiple times and perspectives coexist.

### B.29.1   interest

another original way of representing time leaving.

## B.30   depletion



Figure B.21: *Screen Series, Depletion*, Scott Snibbe

Depletion [17] (see figure B.21) is a virtual screen with a fixed quantity of energy. As bodies enter its bright projected field, their shadows eat away at the projected light itself. Wherever they move, the screen no longer exists their bodies consume the projected light. The work highlights the frailty of immaterial projection film fades, videotape warps and decays, bulbs burn out, and electronics short circuit. Depletion shows that cinema is not the most durable, but the most fragile of media. Depletion also refers back to abstract expressionist composition by allowing viewers to create "motion paintings" through full-body gestures on its subtractive canvas.

## B.31   hole-in-space

Kit Galloway and Sherrie Rabinowitz made "HOLE-IN-SPACE"[37], in both New York City and Los Angeles in 1980. People walking by the Lincoln Center for the Performing Arts in New York City and The Broadway department store in L.A. were connected to each other live through a large video screen. This Public Communication Sculpture was the first of its kind: video-conference installation in two different cities, connecting random people.

## B.32   hole in the earth

An installation [38] which takes place on the two sides on the earth simultaneously. Through this 'virtual hole', people can see and hear the other side of the earth (see figure B.22).

## B.33   world/world

World/world [39] is a poll that virtually runs through the earth and emerges on each end. Participants can push and pull this pole on one side of the earth and someone on the other side may push

Figure B.22: *Hole in the Earth*

back. Participants can see the motion of the pole and persons they are communicating with on the other side of the earth.
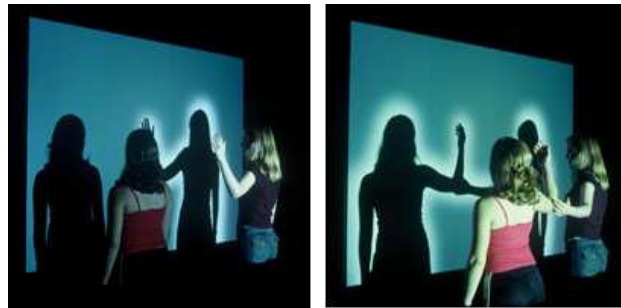
## B.34 concentration



Figure B.23: *Screen Series, Concentration*, Scott Snibbe

Concentration [15] (see figure B.23) craves bodies. Untouched, this screen presents a pristine rectangle of white light. As viewers walk into the field of this projected screen, the light of the screen immediately collapses around the viewer's silhouette. This light concentrates only around a single person within the screen's field. When viewers or their shadows touch, the light expands from one person to another. Light touches result in a flickering aura, reminiscent of a light bulb with a loose electrical connection. The screen's glow can be transferred from person to person by reaching with their shadow into the body's core.

## B.35 bodymovies, relational architecture 6

In BodyMovies[40], thousands of photo portraits taken on the streets of the cities where the project is exhibited are shown inside the projected shadows of local passers-by, whose silhouettes measure between 2 to 25 metres high, depending on how far people were from the powerful light sources placed on the floor of the square (see figure B.24). A custom-made computer vision tracking system triggers new portraits as old ones are revealed.

Figure B.24: *BodyMovies*

### B.35.1 interest

the hidden/shown part of the interface is people' faces. The user discovers others passers-by. one perceive the others through his own effort.

### B.35.2 lack, regret

no interactive relationship is possible.

## B.36 resonance of 4

Resonance of 4 [46] is an interactive audio-visual installation that allows four people to create one musical composition in cooperation with each other.

# Appendix C

# Contours following

An area is at least two 0 pixels on a 1 background. In an area,

$P_n$ is the number n pixel of the contour,

$D_n$ is the direction from $P_n$. Here is the table of the direction:

| 7 | 0 | 1 |
|---|-----|---|
| 6 | $P_n$ | 2 |
| 5 | 4 | 3 |

$n = 0$   $P_0$ = first pixel without a mark

      $D_0 = 5$

$n \geq 1$ **LOOP**    See each neighboor from $D_n$ in ?

      $P_{n+1}$ = first 0 pixel seen

      $D_{n+1} = [P_{n+1}P_n + 1] \mod 8$

      if $(P_{n+1} \neq P_0)$

      then

          $n := n + 1$

          go to **LOOP**

      else stop

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[48]  http://www.cse.ohio-state.edu/ jwdavis/CVL/Research/VirtualAerobics/pat_abcnews.pdf

[49]  http://www.hc.ic.i.u-tokyo.ac.jp/ minomo/shadow/index.html

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