Année 2003 -2004 **D.E.A. Art, Science, Technologies** **Grenoble**

Technologie et art du mouvement

(Développement de deux projets personnels)

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Introduction

I developed the following two projects both to create material for the course evaluation but also to study the characteristics of dynamic movement (something that I've never done in such a deep way) as a personal interest. I made out two movies from that with two different methods: the first is a phenomenological model of a walking man and the second is a physical model of a falling leave.
Preparing the first one took about half month of discontinuous work, and was spontaneously realized during the "Technology and movement art" courses. I developed it for myself at the beginning: I was interested in knowing if I could reproduce a real-like walking dynamics. I found at first a deep technical problem: I didn't know how to realise it, so I try to observe everyday movements, people walking, different personal kinds of walking to find out the constants in movement. Finally I discover I could paint a lot of images following some guide functions. I've extracted some guide lines from people's movements, painted some picture following these functions and displayed them fast (25 frames per second) with simple software to obtain a nice very basic effect.
Developing the second model was easier because I made it after having attended all "Technology and art movement" courses. I follow the dynamic model described in the course essay and very fast (half day work) I realized a very simple falling leave model on Mimesis.

The Walking man model

Dynamics functions and sense of reality
Observing people walking, but mostly my body movements (trying walking in my 9 m^2 room), I found out, that complex body movements can be divided in several basic functions[1]. We can also say that every basic function is indispensable to simulate the exact movement, but in a basic simple approximation there are functions that carry "sense of reality" more than others. If we want to realise an approximated model but real-like we can concentrate of these reality-carrying functions and leave behind the others that carry more subtle elements. Functions composing body movements seems in a way to be weighted in importance by the sense of reality they transmit, and so we can choose the degree of reality simulation we want choosing between functions: first we will focus on the heavier functions, carrying a strong reality feeling (the dynamic heart of the movement we perceive) and then concentrating on the lighter functions, that can lead our model t more subtle, fine descriptions.
In my walking man model, as a novice, I will concentrate on the fundamental functions leaving for a further development the studies on the more fine functions description.

The walking body guide line functions
In the particular case of walking I concentrated on different body parts movements.
I first examined the body movement. I created a man in a very simple body shape: a circle for the head, two parts arms and hands, two parts legs and feet and then I spline the different composites two create a basic man contour. I used Paint software to paint all my figures. I wanted a simple basic tool, which allows me to copy/paste, change dimension, and rotate conserving light image size (all light bitmaps on my pc).

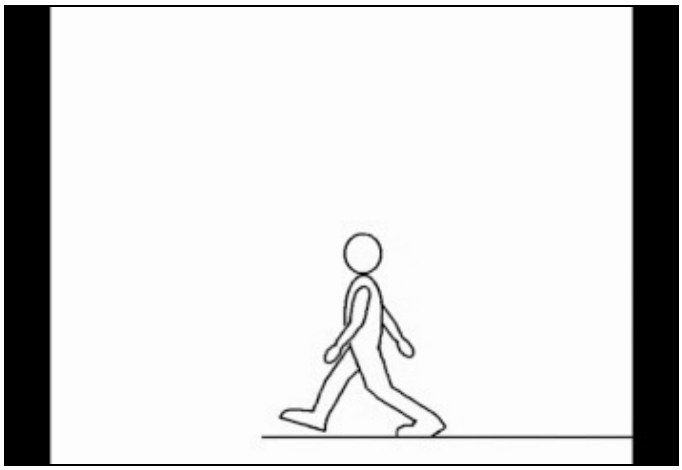


Figure 1 – Walking man shape

[1] This knowledge is for shure well explained in physics elementary studies, but if someone's never applied it to real life complex movements, or body movements, this aspect can be a surprising discovery.

Then I try to figure out what each single human body part did during walking. I realised in a good approximation that head could be considered as coherent to the body in its movement (like as they make together one single part): the neck is so thought as perfectly solid.
Then I observed the body movement: in my description it's got both a horizontal movement and a vertical one. I noticed that people's walking is regular. It means that the human body advancing speed is constant: even if the movements are periodic and complex our nature gave us constant advancing result. The effect related to periodic movement is the slightly going up and down of our body-head complex during the march: the head is lower in case of divaricated legs and it's higher in case of standing positions. I represented the vertical and horizontal effect in a sinusoidal function undulation of the body during walking: for every instant the body advances of a fix constant distance and at the same time it follows a sine function synchronic to legs movements.

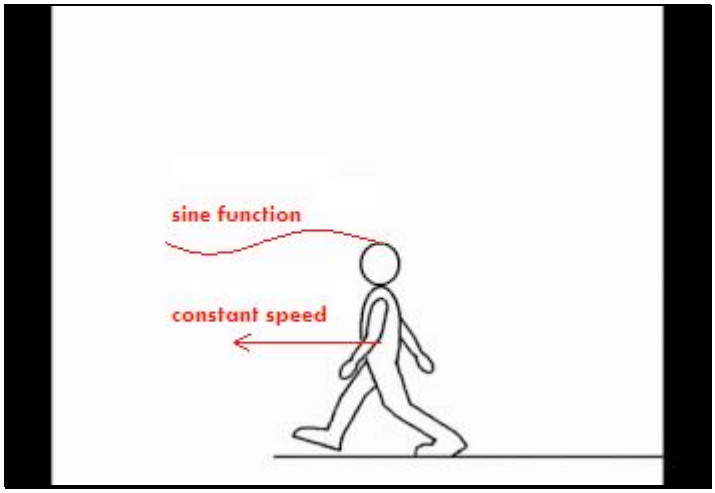


Figure 2 – body movement guide functions

Then I concentrated on legs movement: I described legs as a pendulous. Their movements are very fast during feet movement (absence of stability/ground contact) and slow when the leg has reached the extreme of oscillation (in this instant the body put the equilibrium on the new leg). All this happens very fast in everyday life but observing correctly is easy to see.
Once I create my model of body walking I add flexing legs (trying to represent real deformation in a phenomenological way) and I add arms movements (every arm synchronized but in opposite phase with the relative leg).
I checked carefully to verify that my model work.

The animation
I try then to exploit my studies on movement to create a funny animation. I didn't want to create many images and so I thought about a simple repeating story, changing slightly for every repetition: a man walking on the four sides the computer screen getting smaller and smaller and then going out by a door.
Turning movements in corners were more difficult to release: I try to make using the same approach for real movements. I studied people approaching walls, decreasing speed, people trying to climb, and finally I concentrated on unreal movements (simulating vertical force changing) and then people getting up from a ground position and beginning to walk. I will not describe every function I try to use in these parts: I think the interest here is the developing of an unreal movement. In my mind I tried to imagine a world similar to Earth in which gravity changes form ground to walls, and imagine a real-like effect in this new physical universe. This was interesting and stimulating, I made few models to reach a satisfying degree of fluidity but in my opinion it's still not enough. The walking movement is still much better than the climbing one, more realistic.
I finally add some music using Cool Edit software. I tried to synchronize movement and music breaks to create a sense of novelty at each repetition. In music, like in the animation, at each repetition something changes.

Have a Good Show!

The Falling Leave Model

Purpose

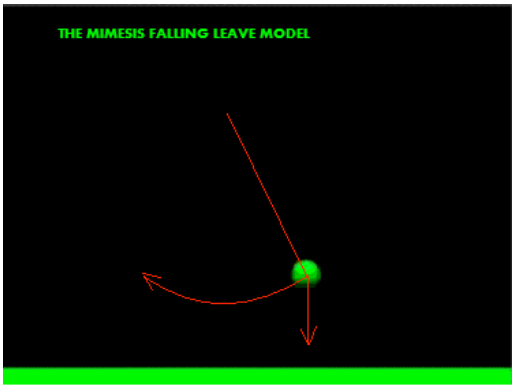
I developed this second model for different reasons:
- to analyse and get familiar with Mimesis formalism and description
- to verify how hard is to create a real model following Annie Luciani's epistemological advertisements
- as a confrontation between my previous empirical model and Mimesis Causal Modelling

Specifications

My model is very simple: observing (in my mind, because now it's winter time) a falling leave, I saw a pendulous movement under the ground attraction force.
I noticed a big resistance in falling, that we can express as strong friction force between air and the leave structure -> We perceive this effects like the leave lightness feeling.
The amplitude of oscillation increases going from top to the ground and the speed, quite fast at the moment of leaving the branch of the three, slows down quite fast under the effect of air friction.
In our model this is the specifications I want to reproduce. I will choose not to focus on the leave structure (that changes shape, etc.), this was too hard at the beginning and has been further well developed by J. Cottinet.

The physical model

To reproduce these effects I formulate my Mimesis model[2]: a SOL[3] (centre of leave rotation) linked by a REF interaction to a MAS element (the leave). The REF interaction is the central problem of the description. Its initial values should be correctly chosen to represent the increasing distance between SOL and MAS, to visually transmit the strong friction force between leave and air, and to recall the leave slowly at the end of its oscillation from left to right (like a pendulum).
To reproduce this I tried different parameter values[4] (the hardest part):
SOL position (0,0)
MAS position (3,-1) weight 0.01 vertical force[5] applied 0.0001
REF ($k=10^{-6}$, Z=0.008,L=7)
The ground was produced by two SOLs at position (-150,-12) and (100,-12) united by a spline function:



I think every model has one or more tricks to understand. The point here was the elongation at the beginning of the REF: at the beginning it should have the possibility of getting longer but constrained by a recall force. REF should be long enough to let the leave fall but not too much to loose the recall movement. The right length to create both a real-like falling movement, and a horizontal oscillation.
The initial values chosen for the REF length was 3.16 so that the interaction could get wider as the gravity force acts on the MAS.

Good Show!

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[2] That is quite the appropriate tool for my description, as I saw physical dynamics laws well described in the leave movements.
[3] I will not explain here every characteristic of Mimesis composites, the reader could reference to my "Technology and art movement" course paper.
[4] Actually at the beginning I lost faith in my model and tried different ones:
- I tried to link the leave between two SOLs: one for the rotation centre and the other to the ground,
- another one consisted in two horizontal SOL that should treat the MAS as a trapezist in a circus under the ground force
But none of the above seemed to work properly. Returning to the beginning model, I found good parameters and the model finally worked out.
[5] I added a light Vertical force to attract the MAS towards the ground.

Conclusions

I can say that both models satisfy me (emotional involvement). But it's obvious that in the walking man model there are still lots of things to optimise, change and add. Some movements are not fluid or are not real like, the rhythm of walking is still artificial but I think it's not bad considering it's my first movie.
The leave model is just an idea of what could be developed: it's good compared to its simplicity; it took much less time than the previous one, with a better quality result. This is also due to different means of productions: ACROE's Mimesis vs Window's Paint, my hand and my observation. I could say Mimesis won but there is no match in life, just choices. It depends always on the specific case, the referential, and the relativity of things.

Acknowledgements:

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I don't want to thank Mr. Bill Gates and Mr. Apple for their lack of discreteness in my life.