

Memories of Oded Maler – The Researcher, the Thinker, the Man

Oded Maler Memorial Day
Grenoble, September 20, 2019

Joseph Sifakis
Verimag Laboratory



Why should we Build Artificial Worms and How?

Oded Maler

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1990-1992

Abstract

In this paper it is argued that a certain class of intelligent systems is worth being investigated and developed. This class consists of elastic robots composed of many components having relatively-simple sensory-motor capabilities, whose most prominent biological realizations are worms, molluscs, elephant trunks and tongues. Understanding how such mechanisms are controlled is an important stage (not to say, a prerequisite) toward the development of “truly-intelligent” autonomous agents. As a preliminary step in this direction I describe a simple elastic object considered as a first approximation of an artificial worm and discuss its control principles.

“Worms have played a more important part in the history of the world than most persons would at first suppose.” CHARLES DARWIN, 1898.

*The opinions expressed in this paper do not reflect the policy or scientific interests of any institute to which the author belongs (or belonged in the past).

1 Introduction

In this research we investigate the control principles for a simple elastic object considered as a first approximation of an artificial worm. This work is motivated by the belief that the design of elastic robots composed of many components having relatively-simple sensory-motor capabilities is an important stage in the development of “truly-intelligent” autonomous agents in general, and more flexible robots in particular. The paper is organized as

The limitations of the so-called traditional AI, inspired by the higher-level capabilities of human beings, are now widely recognized. The ultimate goal of this “symbolic” approach was an artifact capable of passing the Turing test, that is, being able to communicate in natural language. The recent revival of cybernetic models is based on the conviction that the problems associated with the interaction with the concrete, physical world are the important and fundamental ones. Consequently, less-evolved creatures such as insects are taken as normative models for artificial creatures (see [Bro86, MG90, Wil90]).

The First Acquaintance – Building Artificial Worms

sponding interaction parameters⁶ with the ground (see figure 1). The force F applied on the masses can be either positive (causing expansion) or negative (causing contraction).

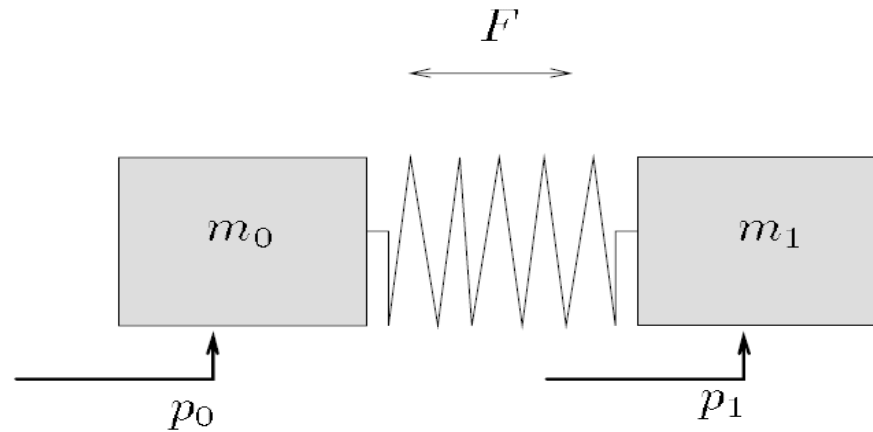


Figure 1: A mechanical model for a one-segment worm.

The overall dynamics is described by the following set of equations:

$$+ F - k(l - l_r) - \nu \frac{dl}{dt} - m_0 \frac{d^2 x_0}{dt^2} - p_0 \frac{dx_0}{dt} = 0 \quad (1)$$

$$- F + k(l - l_r) + \nu \frac{dl}{dt} - m_1 \frac{d^2 x_1}{dt^2} - p_1 \frac{dx_1}{dt} = 0 \quad (2)$$

Hybrid Systems and Real-World Computations

Finally by mentioning some trends and developments in computer science, AI, robotics and cognitive science, I hope to put HS in a broader perspective and show you that the transition to HS might be even more significant than you think. Since, unlike other participants, I did not have any astonishing new results on HS since the announcement of this workshop² the talk will be completely non-technical, and the uninterested ones among the audience can find comfort in other presentation in this workshop.

* This talk was presented in the first workshop on hybrid systems, Lyngby, Denmark, 1992.

Hybrid and Timed Systems – The Lyngby Workshop

File Edit View Go Message Events and Tasks Tools Help

Inbox - Joseph.Sifakis@univ-gre Fwd: A Kid from Mount Carmel X

Get Messages Write Chat Address Book Tag Quick Filter

Search <Ctrl+K>

From Oded Maler ★

Reply Reply All Forward Archive Junk Delete More

Subject **Fwd: A Kid from Mount Carmel**

7/20/2015, 12:34 PM

To Joseph Sifakis ★

First chapter translated from Hebrew.

I disagree, by the way, with you about my Lyngby talk <http://www-verimag.imag.fr/~maler/Papers/realw.pdf> I also had an argument with [REDACTED] about it. I agree it has autistic elements but also prophetic ones.

--Oded

Hybrid and Timed Systems – Oded and Amir



On the Synthesis of Discrete Controllers for Timed Systems* (An Extended Abstract)

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Abstract. This paper presents algorithms for the automatic synthesis of real-time controllers by finding a winning strategy for certain games defined by the timed-automata of Alur and Dill. In such games, the outcome depends on the players' actions as well as on their *timing*. We believe that these results will pave the way for the application of program synthesis techniques to the construction of real-time embedded systems from their specifications.



Preface

Hybrid systems are dynamical systems consisting of interacting discrete and continuous components. They are used to model the combined behavior of embedded real-time systems and their physical environments. This topic is becoming very active in Computer Science, due to the increasing importance of embedded and real-time systems and the emergence of results showing that some techniques used for the

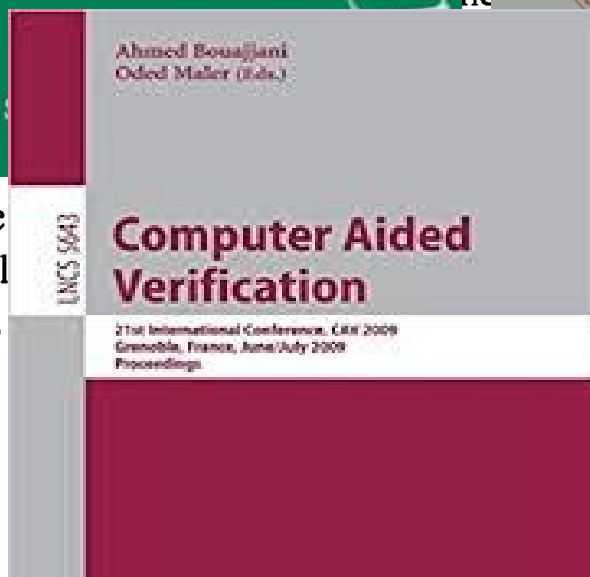
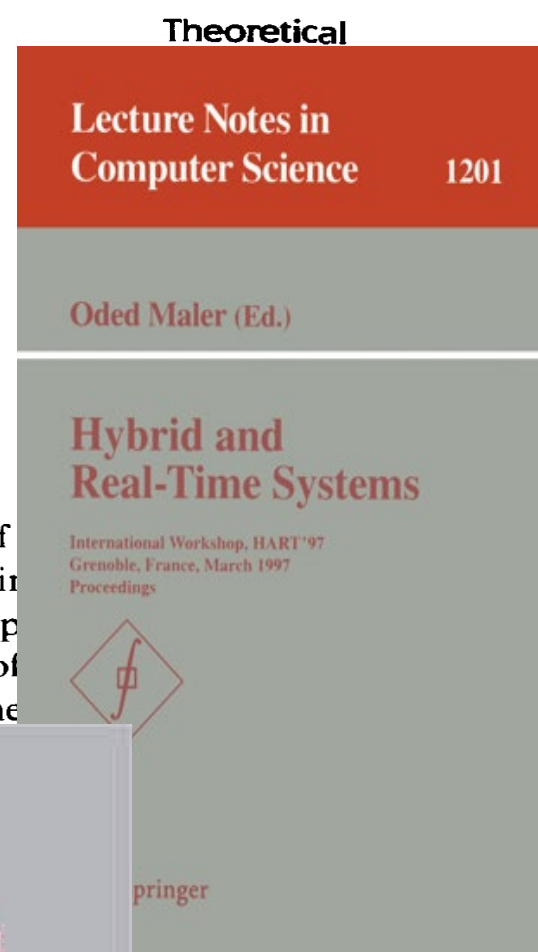
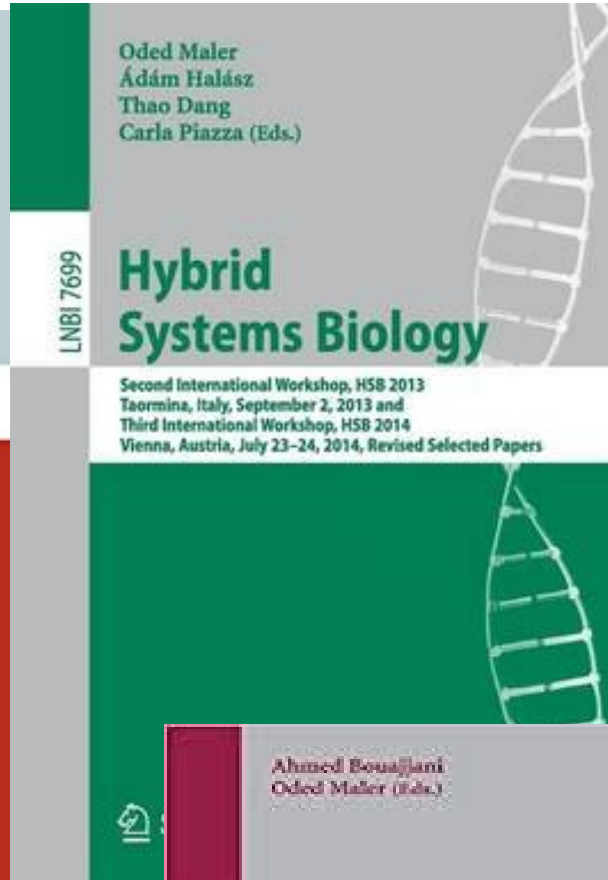
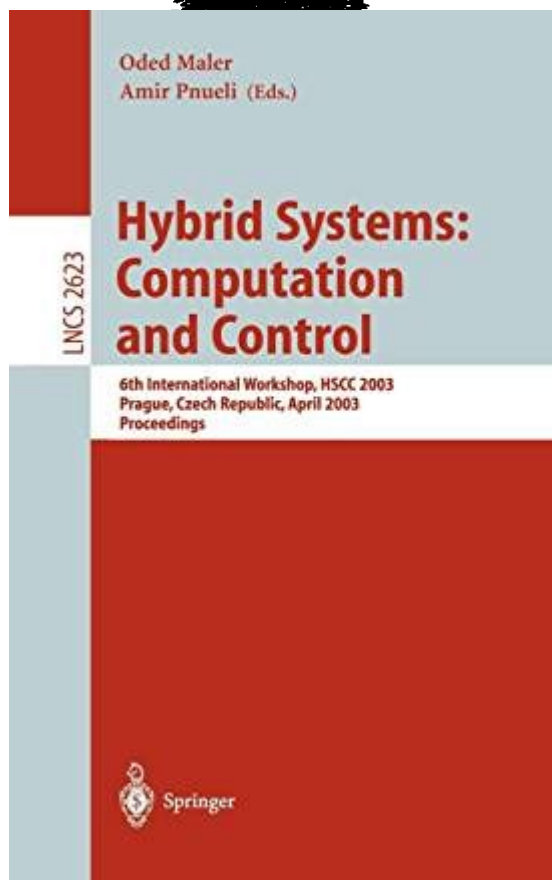
2

Preface/Theoretical Computer Science 138 (1995) 1–2

our hope that this special issue will contribute to the development of the fascinating topic of hybrid systems and will help to clarify to the involved communities the broad scope of the subject, as well as establish some common models and views.

AMIR PNUELI
JOSEPH SIFAKIS

Hybrid and Timed Systems – The Team at Verimag

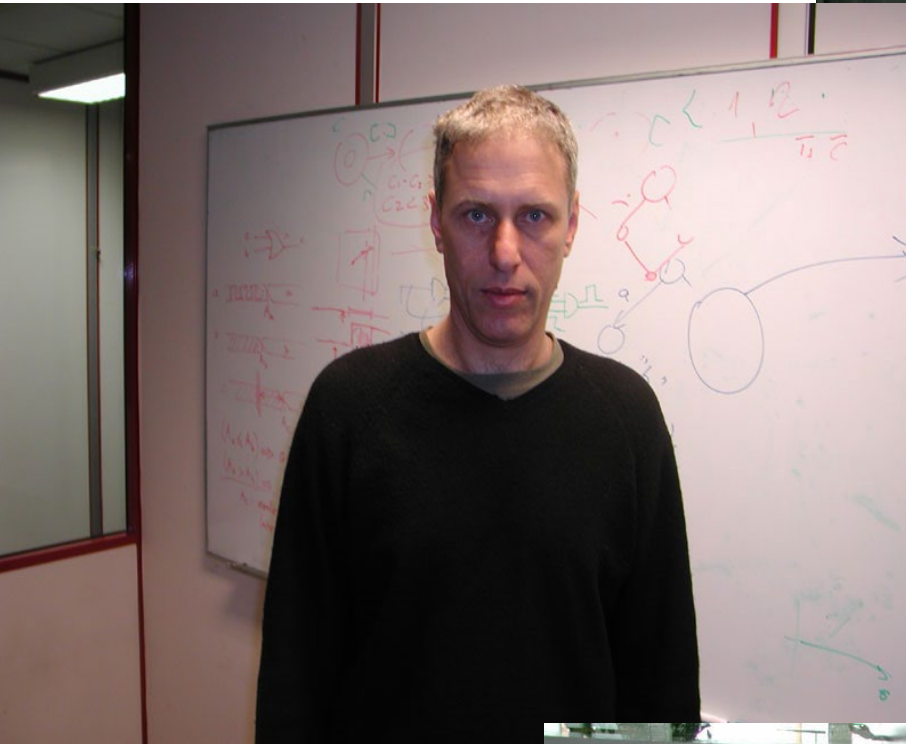


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AMIR PNUELI
JOSEPH SIFAKIS

Hybrid and Timed Systems – The Team at Verimag



Document d'Habilitation à Diriger des Recherches

Université Joseph Fourier

Systèmes Discrets, Temporisés et Hybrides

Oded Maler

May 30, 2000

Chapter 2

**State Identification for
 ω -Automata**

Chapter 3

**The Krohn-Rhodes
Decomposition Theorem**

Chapter 4

Hybrid Systems I

Chapter 5

Timed Systems: Synthesis

Chapter 6

Circuits and Timed Automata

Chapter 7

Timed Systems: BDDs and Discretization

Chapter 8

Discrete Infinite-State Systems

Chapter 9

Timed Regular Expressions

Chapter 10

Probabilistic Systems

Chapter 11

Hybrid systems II

Chapter 12

Representation of Polyhedra

On the Unbearable Lightness of Deep Learning*

Oded Maler

April 20, 2016

Approximate Learning of Monotone Functions

Oded Maler

September 15, 2016

Making Sense of Barbaric Learning

Oded Maler

January 16, 2018

Abstract

Why and how “deep” neural learning works (when/if it works) and how it can be related to other more traditional notions. In particular we are interested in the recurrent branch of learning which deals (practically, without always being explicitly aware of) with learning formal languages and sequential machines.

New Frontiers in Monitoring

Oded Maler

April 3, 2015

On Monitoring Technology

Oded Maler

June 10, 2015

Monitoring: Qualitative and Quantitative, Real and Virtual, Online and Offline

Oded Maler

July 16, 2016

On Formal Verification of Autonomous Cars

Oded Maler

October 3, 2017

On Input and Output Coverage in Real and Virtual Life

Oded Maler

August 28, 2015

What Should Cells Compute and How?

Oded Maler

March 8, 2018

Compositional Reasoning on Data-Flow Models

Oded Maler

March 20, 2018

Contracts of Determined Duration

Oded Maler

March 14, 2018

A Kid from Mount Carmel

Chapter 1: Where and when did I go out to the world and what used to be there before

The first photons from the sun knocked on my eye lids in the morning of February 21st, 1957 according to the Christian counting, 20 of Adar A, 5717 according to ours. I came to the world in one of the eastern corners of the Mediterranean Sea, Our Sea as the Romans used to call it. The event took place where the hill also known as Mt Carmel, a wild extension of the Samaria Mountains that rushed toward the sea, loses the little height that she had and drops down, leaving between itself and the sea a narrow coastal strip. In the day I emerged from the treacherous womb of my late mother, this piece of space was occupied by the RAMBAM hospital, then only a small five-story building in the Bat Galim neighborhood of Haifa. RAMBAM is, by the way, an acronym of Rabi Moshe Ben Maimon (Maimonides in Greek and Latin) the greatest Aristotelian Jewish philosopher of the Middle Ages. He was born in Cordoba in Muslim Spain and following the rise to power of religious extremists had to migrate to Morocco and later to Cairo where he made his name in Medicine and Philosophy until his death in 1204.



The Relentless Thinker

(Despite the allergy to philosophy)

Of course I did not mean allergy to philosophical thinking in general. You force me (but with a very small resistance, I must admit) to write back rather than try to focus on difficult matters..

I was telling some people in the cafet that in the period between Shapiro and Pnueli, while I was trying to find a PhD advisor I went to Haifa to discuss with Jxxxx ...- a crazy person like all logicians - and Ixxxx.....

One criticism that I got from them was the "I do not think in the model". Now after some progress I made in the years, I know what is thinking in the model and I do it without thinking about it - but also its limitations in periods of creativity and finding new ideas and concepts.

Bon bref et bon weekend,

--Oded

30/10/2015

Title **"this is not your father's formal verification"**

Oded: An interesting collection of surveys on formal verification in hardware.

Me: Sounds like an advertisement ... Of course, verification has been successful mainly in HW - because models are simpler and faithful. It becomes a mess when it comes to SW and mixed HW/SW.

Oded: I would not qualify it as advertisement. It is a world view quite different from the one we see from our ivory tower, that uses the same word for something quite different. Two anecdotes: at the beginning of HS you were invited by XXXX to give a presentation to French automaticiens and you told them what you think are the research problem in HS and then one of their elders told you that it is up to them to decide what the research problems are. The 2nd observation is about why a Christian priest may feel uncomfortable in synagogue: he sees these people who repeat their ceremonies, some of which are 1500 years old, with a iota of influence of that crucifixion in Jerusalem and what followed - ignoring it completely.

Sorry, I'm in a period of associations, not always understood by others..

The Relentless Thinker

★	From	Subject	Recipient	Date
☆	Oded Maler	← The hairy Buddha	● Thao Dang, Eugene Asarin	4/27/2016
☆	Oded Maler	← on God and Godel	● Joseph Sifakis	8/28/2015
☆	Oded Maler	Re: Despite the allergy to Philosophy	● Joseph Sifakis	10/30/2015
☆	Oded Maler	nice quote from Khrushchev	● Joseph Sifakis, Eugene Asa...	11/2/2015
☆	Oded Maler	travaillons notre jardins	● Joseph Sifakis	11/16/2015
☆	Oded Maler	← Fwd: One needs to justify his actions	● Joseph Sifakis	2/8/2016
☆	Oded Maler	ottoman memories	● Joseph Sifakis	4/3/2016
☆	Oded Maler	la poesie de jour	● Joseph Sifakis	4/28/2016
☆	Oded Maler	← Re: feynman's paper	● Joseph Sifakis	5/13/2016
☆	Oded Maler	← Fwd: A recent study on Khazar hypothesis	● Joseph Sifakis	6/22/2016
☆	Oded Maler	Re: petit village Gaulois	● Joseph Sifakis	6/30/2016
☆	Oded Maler	← Re: on biological computing	● Joseph Sifakis	9/17/2016
☆	Oded Maler	← Elites	● Joseph Sifakis	9/18/2016
☆	Oded Maler	← I'm in tel Aviv	● Joseph Sifakis	9/30/2016
☆	Oded Maler	← Athens et Jerualem	● Joseph Sifakis	1/15/2017
☆	Oded Maler	← Fwd: On the interpretation of topological concepts in the physica...	● Joseph Sifakis	1/30/2017
☆	Oded Maler	Purim	● Ebrahim Ardeshir, Borzoo ...	3/13/2017

The Relentless Thinker

☆	Oded Maler	👉 nostalgia corner	● Ahmed Bouajjani, Eugene ...	🕒 4/7/2017, 2:35 PM	3.3 KB
☆	Oded Maler	earthquake	● Joseph Sifakis	🕒 7/22/2017, 8:08 AM	3.0 KB
☆	Oded Maler	Re: Consciousness	● Joseph Sifakis	🕒 10/8/2017, 12:13 PM	26.8 KB
☆	Oded Maler	👉 Re: Consciousness	● Joseph Sifakis	🕒 10/8/2017, 2:36 PM	28.6 KB
☆	Oded Maler	Re: Consciousness	● Joseph Sifakis	🕒 10/10/2017, 10:26 AM	8.3 KB
☆	Oded Maler	learning book	● Joseph Sifakis	🕒 11/6/2017, 10:31 AM	3.4 KB
☆	Oded Maler	hot air	● Joseph Sifakis	🕒 11/9/2017, 10:43 AM	3.6 KB
☆	Oded Maler	an interesting book (i read some chapters of the Hebrew version)	● Oded Maler	🕒 5/9/2018, 2:55 PM	4.5 KB
☆	Oded Maler	It's like the weather, everybody is talking about it without doing ...	● Joseph Sifakis	🕒 5/29/2018, 6:54 PM	3.5 KB
☆	Oded Maler	Fwd: Re-re-rebooting :)	● Ouri Maler, Joseph Sifakis	🕒 6/21/2018, 3:17 PM	3.7 KB
☆	Oded Maler	Fwd: Amazon.com order of The Idea Factory: Bell Labs and the G...	● Dejan Nickovic, alex@decy...	🕒 7/8/2018, 5:06 PM	39.9 KB
☆	Oded Maler	Mathematical and Physical Theories	● Joseph.Sifakis@univ-gren...	🕒 7/19/2018, 9:17 AM	4.8 KB
☆	Oded Maler	The Emperor's New Logic	● Joseph.Sifakis@univ-gren...	🕒 7/19/2018, 9:19 AM	8.0 KB
☆	📁 Oded Maler	Philosophy of computation	● nicolas.basset1@univ-gren...	🕒 7/29/2018, 1:41 PM	934 KB
☆	Oded Maler	Physicists	● Eric.Fanchon@univ-greno...	🕒 8/23/2018, 5:07 PM	4.7 KB
☆	Oded Maler	👉 As We May Think - The Atlantic	● Joseph.Sifakis@univ-gren...	🕒 8/24/2018, 2:23 AM	3.2 KB

The Human Face

From Oded Maler★

Reply

Reply All ▾

Forward

More ▾

Subject **something different**

4/10/2015, 11:16 AM

To Joseph Sifakis★

Salut Joseph,

I can now tell you that I have some health problems. I was diagnosed 5 months ago [REDACTED]

[REDACTED] So I'm in the hospital for few weeks in kind of isolation (in the biochemical sense not the information sense as you may see from this mail).

Le voila,

--Oded

The Human Face

From Oded Maler ★



Subject **Re: something different**

4/10/2015, 4:12 PM

To Joseph Sifakis ★

On 10/04/2015 15:24, Joseph Sifakis wrote:

Salut Oded,

I think in this kind of situation the most important thing is le moral.

Please let us know if we can be useful with any matter.

I understand that the isolation is physical - so I cannot visit you. Right?

There are schtoumpf-like things that visiteurs should dress when visiting- let's wait, for the moment nurses and internet suffice..

--Oded

The Human Face – La Sortie d’Egypt !

File Edit View Go Message Events and Tasks Tools Help

Inbox - Joseph.Sifakis@univ-gre La sortie d’Egypt - Inbox - Jc X

Get Messages Write Chat Address Book Tag Quick Filter

Search <Ctrl+K>

From Oded Maler

Reply Reply All Forward Archive Junk Delete More

Subject La sortie d’Egypt

5/4/2015, 4:09 PM

To Nicolas HALBWACHS, Florence MARANINCHI, Saddek Bensalem, Susanne Graf, Joseph Sifakis



The Human Face – How a Workshop of Theoreticians Ends

From Oded Maler ★

↩ Reply

↩ Reply All ▾

➔ Forward

More ▾

Subject **How a workshop of theoreticians ends**

5/13/2016, 11:12 AM

To Joseph Sifakis ★

Cc Oded Maler ★



The Human Face – The Dumpster of History

From Oded Maler ★

Reply Reply All Forward Archive Junk Delete More

Subject **Le poubelle d histoire**

5/16/2016, 9:47 AM

To Ahmed Bouajjani ★, Eugene Asarin <asarin@liafa.univ-paris-diderot.fr> ★, Joseph Sifakis ★, Dorit Maler ★

IMG_0120.JPG



The Human Face

From Oded Maler 

 Reply

 Reply All 

 Forward

 More

Subject **Re: Hello there**

7/19/2017, 8:45 A

To Me <Joseph.Sifakis@univ-grenoble-alpes.fr> 

Salut Joseph,

I'm surviving, going trough a new treatment, trying to do some research and finalize a thesis. (



Oded

From Me <Joseph.Sifakis@univ-grenoble-alpes.fr> 

 Reply

 Reply All 

 Forward

 More

Subject **Re: Hello there**

7/19/2017, 10:56

To Oded Maler 

Cc Joseph Sifakis 

Dear Oded,

I liked your character from the beginning and I am proud of you and your achievements - this is very sincere believe me.

