1 Personalia

Name: Werner Van Belle
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Birth: 21 June 1975
Nationality: Belgian
Marital Status: Married
Languages: Dutch (Flemish), English & German

Contents

2 Expertise & Education

My expertise lies in three distinct areas: **bioinformatics**, **signal processing** and **distributed systems**. My education summarized by the dissertations,

Sep 2003: Defended my PhD in computer science at the University in Brussels (VUB, Belgium). It was titled *Creation of an Intelligent Concurrency Adaptor in order to mediate the Differences between Conflicting Concurrency Interfaces*.

Jul 1997: Master in Computer Science, University Brussels (VUB, Belgium). The dissertation was titled *Design and Development of a Mobile Multi-Agent Architecture* and achieved highest honours.

Jun 1993: Finished high school with a specialisation in Chemistry. The dissertation was on PAN (polyacrylonitril).

3 Previous Employment

Employer	Group	Position	Start Date → End Date
University Brussels	PROG	OZR Grant	01/10/1997 → 31/12/1997
MediaGeniX		Junior Software Engineer	01/01/1998 → 28/02/1998
University Brussels	INFO	System Administrator	01/03/1998 → 31/12/1998
	PROG	FKFO Project Researcher	01/03/1998 → 31/12/1998
University Brussels	DINF	Interim Assistent (Teaching Position)	01/02/1999 → 30/09/1999
	PROG	FKFO Project Researcher	01/02/1999 → 30/09/1999
University Brussels	PROG	IWT SEESCOA Project Researcher	01/10/1999 → 30/09/2003
University Tromsø	IFI/CS	Postdoctoral	01/03/2004 → 14/04/2004
NORUT	IT	Research Scientist	15/04/2004 → 16/03/2007
University Tromsø	VIRO	Postdoctoral	01/01/2006 → 31/12/2006
Tromsø Hospital	MEDGEN	LabForum Leader/Data Analysis Quality Control	19/03/2007 → 31/12/2007
ETH Zürich	BSSE	Senior Research Assistent	01/03/2008→ 28/02/2009
DHBW		Dozent	01/09/2009→ 30/04/2010
Des Pudels Kern	Audiotool	Senior Software Developer	15/07/2011→ 31/10/2012

Abbreviations: PROG = Programming Technology Lab; DINF = Department Computer Science; MEDGEN = Medical Genetics; BSSE = Department for Biosystems Science and Engineering; DHBW=Duale Hochschule Baden-Württemberg

4 Signal Processing

When working at Des Pudels Kern I was involved with the creation of DSP signal processing modules.

1. IIR (butterworth, chebyshev 1-2, bessel) filters
2. Linkwitz-Riley crossover
3. Resampling using sinc interpolation/farrow filter coefficient interpolation
4. DC offset removal
5. Development of single band/multiband compressors, limiters
6. Fixed rate and multirate filterbanks
7. FIR filters, circular, non circular convolution using FFT

8. Time pitch modifications in the time domain
9. Sinusoidal modelling
10. Matching equalizing using linear phase filters
11. Hilbert filters
12. Transient detection
13. Exciter
14. Stereo modeling using a head related transfer function
15. Synthesizer development
16. Phase modulation kernel for an FM Synthesizer
17. Fast computation of exponential envelopes
18. Lo/hi shelving filter section
19. Wavetable bandlimiting

I also extended the work I did for BpmDj for

1. Tempo detection
2. Rhythm detection
3. Time signature analysis
4. Spectral envelope measurement
5. Music visualisation using beatgraphs, voiceprintsm rhythm plots
6. Nearest neighbor detection in music space

5 Projects

Bioinformatics

- Analysis of Microarrays (MEDGEN,VIRO)
- Analysis of siRNA Screens (ETHZ)
- Analysis of data generated by 'Sequencing by synthesis' (Deep Sequencing) (ETHZ)
- Data mining in epigentic datasets (ETHZ)
- Denoising of Mass Spectrometric Data (MALDI-TOF & TOF/TOF) (NORUT)
- Statistical Analysis of Realtime/Quantitative PCR experiments (MEDGEN)
- Image & Statistical Analysis of 2D Electrophoretic Gel images (NORUT)
- Prediction of relevant genes/proteins through analysis of protein intereaction maps (NORUT,MEDGEN,ETHZ)
- Image & Statistical analysis of transgenic mice (MEDGEN,VIRO)

Deep Sequencing Facility Basel

From March 2008 to March 2009 I was responsible for setting up a primary analysis pipeline for the Deep Sequencing Facility in Basel. This included various aspects among which understanding the Illumina software but also administrative issues such as sample tracking and data delivery.

During this period, I also researched how to find useful relations between various genomic signal tracks. To this end I tested a number of novel approaches on Human Histone Methylation and Acetylation patterns. This was very interesting and offered a number of novel insights.

Behavioral phentoyping Transgenic Mice

For the department of Medical Genetics at the Hospital of Northern Norway, I created tools to analyze transgenic mice (behavrioal phenotyping). This included filmin mice and creating tools to analyze the videos afterwards as well as statistical processing of the results.

Micro Arrays & Protein Interaction Maps

In connection with the Virology department of the University Of Tromso, I investigated the measurement accuracy of the microarray facility. This resulted in the development of a new technique in which confidence intervals on all the measured dots are reported. This information was further used to integrate a protein interaction map and predict which proteins are likely influenced by/will likely influence MK5.

2DE Gels

In connection with Haukeland University Hospital (Bergen) we investigated P53 (a protein related to cell life and death and its gene is often mutated in cancer). We received bio-signatures of P53 expression for various leukemia patients and got the challenge to analyse these. First we needed to remove various artifacts from the images, including camera geometry artifacts, washing and drying effects, scratches, bubbles, light conditions and translational, rotational and zooming variances. In this research we developed a novel denoising technique. Afterwards, alignment was necessary and the analysis of the actual data. This led to a novel analysis technique that is being patented.

Mass Spectrometry

MALDI-TOF mass spectrometry is a well known and widely used technique to fingerprint and sequence proteins. However widely used, the signal output of these machines often contain disturbing artifacts such as *static tones, linearly up-sweeping tones, exponentially decaying tones and probabilistic pulse trains*. Their presence reduces the *accuracy of peak localization* and might *introduce phantom peaks*. This further complicates a) automatic selection of peaks, b) makes it impossible to normalize mass spectrogram's and c) in general reduces the performance of high throughput proteomics. We developed a) a number of specialized algorithms to remove these artifacts, based on wavelets, and b) a number of techniques to automatically assign confidence scores to peaks, based on auto-correlation techniques and machine modelling. The combination of the presented techniques allow for an accurate and automated sample analysis, which in turn helps in the determination of the sample content.

5.1 Audio Analysis

5.1.1 BpmDj

In 2001 I created a fully automatic BPM counter to measure the tempo of music. This is done by autocorrelation, which in itself is not a new technique, however at that moment the use of this technique to measure the tempo was entirely new. Over the years this program has been extended to recognize sound spectra, rhythmical information, ambiance and compositional information. This allows the program to automatically select matching songs, cluster them and visualize them using a PCA analysis. More information can be found at http://bpmdj.yellowcouch.org/. The current modules include

Tempo module - Five different tempo measurement techniques are available of which auto-correlation and ray-shooting are most appropriate. All analyzers in BpmDj make use of the Bark psycho-acoustic scale. The spectrum or sound color is visualized as a 3 channel color (red/green/blue) based on a Karhunen-Loéve transform of the available songs.

Echo/delay Modules - Measuring the echo characteristics is based on a distribution analysis of the frequency content of the music and then enhancing it using a differential auto-correlation.

Rhythm/composition modules - Rhythm and composition properties rely on correct tempo information. Rhythm relies on cross correlation and overlaying of all available measures. Composition relies on measuring the probability of a composition change after x measures.

From an end-user point of view the program supports *distributed analysis*, *automatic mixing* of music, *distance metrics* for all analyzers as well as *clustering and automatic classification* based on this information. Everything is tied together in a Qt based user interface.

5.1.2 CryoSleep Mood Induction

Cryosleep is a program that generates soothing brainwaves relying on the bi-aural effect. I developed this from 2003 to 2005 and has proven to be a very popular download. The value of the program comes both from its unique noise shaped frequency spectrum (the sounds are very 'friendly' to listen to) and its free availability at http://werner.yellowcouch.org/Cryosleep. Cryosleep relies on a power-law to alternate the composition and on the bark psycho-acoustic scale for frequency selection.

5.2 Distributed Systems

5.2.1 Ship to Shore Protocols

In 2006 I became involved with ship to shore protocols -or- how to solve very practical network problems with the following requirements: a) the off-boat interface can change at any time, but the internal network needs to stay fully connected b) how to bring up/down outgoing links; c) how to control incoming and outgoing connections based on current cost-rate and d) how to install a least cost routing engine on such a router ? To approach this problem we investigated NuFw, IPv6 and Mobile IP.

5.2.2 Concurrency API Conflicts in Open Distributed Systems

From 2001 to 2003 I wrote my PhD, a monograph titled "*Creation of an Intelligent Concurrency Adaptor in order to mediate the Differences between Conflicting Concurrency Interfaces*". It contained 14 distinct chapters, of which 10 standing independent. The full text is available on my homepage. In summary, I investigated a particular problem of open distributed systems namely: concurrency management between components written by different manufacturers. All too often, the concurrency-strategy provided or required by a component is badly documented and rarely matches the concurrency strategy provided or required by other components. Whenever this happens there is a *concurrency interface conflict*. Solving such conflicts can require a substantial amount of manpower, especially because in open distributed systems components can be updated without prior notification and without guarantees that new interfaces are backward compatible. Concurrency behavior modifications can range from syntactic modifications over slight semantic differences to completely new concurrency strategies. For example, changing a nested locking strategy to a non-nested locking strategy or changing a non-blocking server to work in a blocking manner.

I approached the presented problem by automatically generating a concurrency interface *adaptor* between various *provided* an *required* concurrency behaviors. This process required the formal documentation of the involved concurrency interface by means of *colored Petri-nets*. Once these are available, a concurrency adaptor is deployed in two stages. The first stage learns how to reach various check points in both the server code and client code, thereby bypassing the concurrency behavior entirely. Then the second stage observe the requested state in the client and realizes it in the server by linking together the common functional Petri-net places (a functional place is one not related to the concurrency strategy).

5.2.3 Distributed Embedded Systems

I have been fully involved in the SEESCOA project, which stands for "*Software Engineering for Embedded Systems using a Component Oriented Approach*". The project ran from October 1999 till September 2003. 4 academic partners were involved: 1) the VUB (Vrije Universiteit Brussel) with *PROG* ('Programming Technology Lab') and *SELL* (Laboratory for Software engineering). 2) the *PARIS* research group of the RUG ('Rijks Univeristeit Gent'). 3) the *DISTRINET* research group of the KUL (Katholieke Universiteit Leuven) and 4) the *EDM* Research group ('Expertise for digital media') of the LUC ('Limburgs Universitair Centrum').

The IWT funded the main chunk of the project with 2 mil EUR. 6 industrial partners were involved. These were: *Siemens*, *Barco-Graphics*, *Agfa Gevaert*, *Imec*, *Philips* and *Alcatel*. Key points of this period:

- In the beginning of the project company visits were organized. During these visits all the different companies explained how they were developing their embedded systems.
- With a plethora of component-definitions wandering around, we had to define what a component was. Therefore I injected the Borg-definition of agents into the project. In essence it is a hybrid of process based systems and event based systems. A component is an autonomous entity. It does not share data with other components. Components can receive messages and react upon them, but they do not have a thread associated with them.
- During the project I was responsible for the development of the entire Java run-time architecture for components. The run-time architecture has been extensively tested and is currently being used in other projects.

- The SEESCOA run-time architecture allows component-based applications to be made distributed without any changes to the underlying components. The resulting applications run peer to peer. Error handling is done at a central place.

5.2.4 Mobile Multi Agent Systems

During 4 years I've been the creator and maintainer of the Borg mobile multi agent system. We viewed a mobile multi-agent as a standalone component that can communicate with other agents and migrate between places (processors). Our research aimed to conceive a distributed system and language that would allow the development of such mobile agents, without presenting the agent programmer with non functional aspects such as connection establishment, fault tolerance and so on.

During this time I researched which distribution aspects one can hide (at an acceptable price) and which ones not. In the end we were able to shield the programmer from finding the communication partners. We provided transparent communication, location transparent migration and transparent replication. We were unable to hide concurrency management (due to its inherent complexity). Therefore we developed a set of control flow modules that abstrahate around typical usage scenarios (whiteboard communication, one-to-many, many-to-one and voting patterns). Later on, this led to the applicability of Petri-nets as a modeling technique.

The Borg mobile multi agent system uses the educational language Pico as its basis. It was developed by my former adviser and due its proper memory and stack discipline enabled *strong* migration already in 1998.

Key-points of this period:

- Developed a virtual machine that allows for location transparent distribution and strong mobility. Coded entirely in C.
- Ported this virtual machine to a Palm V.

6 Dissemination

* is the corresponding author. † are equal contributors.

Publications

1. Werner Van Belle*; *Zathras-1: time stretching audio through matrix-multiplication;* Audio Processing; Yellow-Couch; Editor(s) ; volume ; November 2015

2. Nina Ånensen, Werner Van Belle, S.M. Hjelle, Ingvild Haaland, E Silden, Jean-Christophe Bourdon, R Hovland, K Taskén, S Knappskog, P.E. Lønning, Oystein Bruserud, Bjørn Tore Gjertsen; *Correlation analysis of p53 protein isoforms with NPM1/FLT3 mutations and therapy response in acute myeloid leukemia;* Correlation analysis of p53 protein isoforms with NPM1/FLT3 mutations and therapy response in acute myeloid leukemia; Nature Oncogene; volume 31; pages 1533-1545; March 2012

3. Abil Saj, Zeynep Arziman†, Denise Stempfle†, Werner Van Belle, Ursula Sauder, Thomas Horn, Markus Dürrenberger, Renato Paro, Michael Boutros, Gunter Merde*; *A Combined Ex Vivo and In Vivo RNAi Screen for Notch Regulators in Drosophila Reveals an Extensive Notch Interaction Network;* Developmental Cell; Elsevier; volume 18; pages 862-876; May 2010

4. Line Sæther*, Werner Van Belle, Bruno Laeng, Tim Brennen, Øvervoll Morten; *Anchoring gaze when categorizing faces sex: Evidence from eye-tracking data;* Vision Research; Elsevier; Editor(s) Cristopher W. Tyler; volume 49; nr 23; pages 2870-2880; August 2009

5. Piotr J. Balwierz, Piero Carninci, Carsten Daub, Jun Kawai, Werner Van Belle, Christian Beisel, Erik Van Nimwegen*; *Methods for analyzing deep sequencing expression data: constructing the human and mouse promoterome with deepCAGE data.;* Genome Biology; Biomed Central; volume 10; nr 7; pages R79; July 2009

6. Nancy Gerits*, Werner Van Belle, Ugo Moens; *Transgenic mice expressing constitutive active MAPKAPK5 display gender-dependent differences in exploration and activity;* Behavioral and Brain Functions; Biomed Central; Editor(s) Terje Sagvolden; volume 3; nr 58; November 2007

7. Werner Van Belle*, Nancy Gerits, Kirsti Jakobsen, Vigdis Brox, Marijke Van Ghelue, Ugo Moens; *Confidence Intervals on Microarray Measurement of Differentially Expressed Genes: A Case Study on the effects of MK5, TAF4 and FKRP on the transcriptome;* Gene Regulation and Systems Biology; Libertas Academus Press; nr 1; pages 57-72; May 2007

8. Werner Van Belle*†, Jessie Dedecker†; *Ambient Actors as a Formalism for Ubiquitous and Mobile Computing;* Handbook for Ubiquitous and Mobile Computing; American Scientific Publishers; October 2006

9. Werner Van Belle*; *Dj-ing under Linux with Bpmdj;* Linux+ Magazine; nr 25; October 2006

10. Werner Van Belle*, Gry Sjøholt, Nina Ånensen, Kjell-Arild Høgda, Bjørn Tore Gjertsen; *Adaptive contrast enhancement of two-dimensional electrophoretic protein gel images facilitates visualization, orientation and alignment;* Electrophoresis; Wiley Interscience Vch; volume 27; nr 20; pages 4086-4095; October 2006

11. Nina Ånensen, Ingvild Haaland, Clive D'Santos, Werner Van Belle, Bjørn Tore Gjertsen*; *Proteomics of p53 in Diagnostics and Therapy of Acute Myeloid Leukemia;* Current Pharmaceutical Biotechnology; Bentham Science Publishers Ltd.; volume 7; nr 3; July 2006

12. Werner Van Belle*, Nina Ånensen, Ingvild Haaland, Oystein Bruserud, Kjell-Arild Høgda, Bjørn Tore Gjertsen; *Correlation analysis of two-dimensional gel electrophoretic protein patterns and biological variables;* BMC Bioinformatics; volume 7; nr 198; April 2006

13. Werner Van Belle*, Bjørn Tore Gjertsen, Rebecca Katherine; *Method and Apparatus for Correlation Analysis of Electrophoretic Protein Patterns;* Submitted as a patent application; Editor(s) Frank B. Dehn; April 2006

14. Werner Van Belle*, Olav Mjaavatten; *Artefacts in the Mass Spectra Output from MALDI-TOF and MALDI-TOF/TOF Machines;* Proceeding of the VIIth International Symposium of the Protein Society section proteomics, interactomics and protein networks; April 2005

15. Jessie Dedecker†, Werner Van Belle*†; *Actors for Mobile Ad-Hoc Networks (The Ambient Actor Model);* Proceedings of Embedded and Ubiquitous Computing (EUC2004); Springer Verlag; Lecture Notes in Computer Science (LNCS 3207); Editor(s) Aizu-Wakamatsu; pages 482-494; August 2004

16. Jessie Dedecker*, Werner Van Belle, Wolfgang De Meuter; *Actors for Pervasive Computing;* Proceeding of the workshop on reference architectures and patterns for pervasive computing (OOPSLA2003); June 2003

17. Werner Van Belle*, Tom Mens, Theo D'Hondt; *Using Genetic Programming to Generate Protocol Adaptors for Interprocess Communication;* Evolvable Systems: From Biology to Hardware, Proceedings of the 5th Intl. Conference on Evolvable Systems (ICES2003); Springer Verlag: Lecture Notes in Computer Science (LNCS 2606); Editor(s) Andy M. Tyrrel and Pauline C. Haddow and Jim Torresen; pages 422-433; March 2003

18. Werner Van Belle*, Karsten Verelst, Kristof Van Buggenhout, Theo D'Hondt; *Is Message Sending Good enough for Distributed Systems ? Communication and synchronisation revisited;* Accepted for publication in the proceedings of the Distributed Object Workshop at the European Conference on Object Oriented Programming 2001 (ECOOP 2001); June 2001

19. Werner Van Belle*, Johan Fabry, Karsten Verelst, Theo D'Hondt; *Experiences in Mobile Computing: The CBorg Mobile Multi-Agent System;* Technology of Object-Oriented Languages and Systems (TOOLS 38): Components for Mobile Computing; IEEE Computer Society Press; Los Alamitos, California; Editor(s) Wolfgang Pree; pages 7-18; March 2001

20. Werner Van Belle*, Karsten Verelst, Theo D'Hondt; *The CBorg Mobile Multi-Agent System;* Edited Volume on Infrastructures for Large-Scale Multi-Agent Systems; ACM; October 2000

21. Stefan Van Baelen*, David Urting, Werner Van Belle, Viviane Jonckers, Tom Holvoet, Yolande Berbers, Karel De Vlaminck; *Towards a unified terminology for component-based development;* Submitted to ECOOP 2000; June 2000

22. Werner Van Belle*, Theo D'Hondt; *Agent mobility and Reification of Computational State;* International Proceedings of Infrastructures for Agents, Multi-Agent Systems and Scalable Multi-Agent Systems; Springer Verlag; Lecture Notes in Artifical Intelligence (LNAI 1887); Editor(s) Tom Wagner and Omer Rana; pages 166-173; June 2000

23. Werner Van Belle*, Karsten Verelst, Theo D'Hondt; *Location Transparent Routing in Mobile Agent Systems - Merging Name Lookups with Routing;* 7th IEEE Workshop on Future Trends of Distributed Computing Systems; IEEE Computer Society Press; Los Alamitos, California; Editor(s) A. Denise Williams; pages 207-212; December 1999

24. Wolfgang De Meuter*, Kris De Volder, Werner Van Belle, Tom Tourwe, Theo D'Hondt; *Prototype Based agents for the Web;* Proceedings of the European Conference on Object Oriented Programming 1997 (ECOOP 1997), workshop on Prototype-Based Object-Oriented Programming; September 1997

Other Articles

1. Werner Van Belle; *FlowDb - getting rid of SQL;* YellowCouch; August 2014

2. Werner Van Belle; *Training a Distance Metric;* YellowCouch; June 2014

3. Werner Van Belle; *Two Solutions to Harmonics due to short Envelope Fades.;* Audio Processing; YellowCouch; January 2014

4. Werner Van Belle; *Estimating the phase of a subbin sine from a local group of frequencies.;* Audio Processing; YellowCouch; January 2014

5. Werner Van Belle; *Fast Tempo Measurement: a 6000x sped-up autodifferencer.;* Signal Processing; YellowCouch; July 2011

6. Werner Van Belle; *Bitslicing: Nearest Neighbors with <30% Data Access for 1000+ Dimensional Uniform Spaces;* Computer Science; YellowCouch; June 2011

7. Werner Van Belle; *Classification of Rhythmical Patterns;* Signal Processing; YellowCouch; September 2010

8. Werner Van Belle; *Rhythm Pattern Extraction;* Signal Processing; YellowCouch; August 2010

9. Werner Van Belle; *Biasremoval from BPM Counters and an argument for the use of Measures per Minute instead of Beats per Minute;* Signal Processing; YellowCouch; July 2010

10. Werner Van Belle; *Active Objects: an Efficient Space/Time Separation of Concurrent Tasks through Active Message Queues;* Computer Science; YellowCouch; February 2010

11. Werner Van Belle; *FlowPipes: Isolating and Rejoining Data Tokens in the context of Data Analysis Pipelines;* Bioinformatics; YellowCouch; December 2009

12. Werner Van Belle*; *Pattern Analysis of Human Histone Methylations and Acetylations through Cross Correlation Maps;* Bioinformatics; YellowCouch; February 2009

13. Werner Van Belle*, Nancy Gerits, Ugo Moens; *Propagating Differential Gene Expression in Protein Interaction Networks;* Bioinformatics; YellowCouch; February 2008

14. Werner Van Belle*; *An Adaptive Filter for the Correct Localization of Subimages: FFT based Subimage Localization Requires Image Normalization to work properly;* Signal Processing; Yellowcouch; 11 pages; October 2007

15. Werner Van Belle*; *Correlation between the inproduct and the sum of absolute differences is -0.8485 for uniform sampled signals on [-1:1];* Signal Processing; YellowCouch Scientific; November 2006

16. Werner Van Belle*; *Antenna Finding and Interpolation/Extrapolation of Signal Strength;* November 2006

17. Werner Van Belle*; *Observations on spectrum and spectrum histograms in BpmDj;* September 2005

18. Werner Van Belle*; *The Failure of the Connectionless Model and the Vice Software Model;* February 2004

19. Karsten Verelst*, Werner Van Belle, Theo D'Hondt; *The Reflective Virtual Machine;* June 2001

20. Werner Van Belle*; *BPM Measurement of Digital Audio by Means of Beat Graphs & Ray Shooting;* December 2000

21. Karsten Verelst*, Werner Van Belle, Theo D'Hondt; *Communication & Synchronization in Mobile Multi-Agent Systems, CSP Revisited;* Submitted to workshop 23 at ECOOP 2000; March 2000

22. Werner Van Belle*; *Reinforcement Learning as a Routing Technique for Mobile Multi Agent Systems;* January 1998

7 Research Proposals

7.1 Bioinformatics

1. Werner Van Belle, Nina Anensen, Bjorn Tore Gjertsen - *P53 Image Analysis* - See section 5 on page 3. The budget was 150'000 NOK.

2. , Kjell Arild Hogda; *Denoising of MALDI-TOF, 2D Gels and NMR Spectra;* June 2005 - In this project we aim to use signal processing techniques to remove noise and normalize data of three different spectroscopy techniques: MALDI-TOF mass spectrometry, 2D gel images and NMR spectroscopy. Removal of noise is important in order to obtain more accurate data, to allow for automatic analysis in high throughput proteomics and to understand experimental limitations. Normalization schemes are necessary to compare results between different machines and different samples. This research will lead to a better quantitative understanding of experimental inaccuracies and allow for quantified biological comparisons. The developed algorithms will be freely accessible through a web interface.

3. , Niels Aarsæther - *Model Inference and Simulation of the PI3 Kinase Pathway;* June 2005 - Cell simulation is the mathematical modeling of the behavior of a cell such that the model can be algorithmically executed, thereby enabling visualized prediction of the behavior of real living cells. Such models will be useful in the future to optimize and regulate biological processes such as the growth of yeasts, fungi and to find new medicines which merely regulate and coerce the cell in working differently/correctly (cancer research, diabetes, ...). In Norway, model inferencing techniques and learning techniques are being used at some institutions (Jonathan

M. Irish, Randi Hovland et al, and Bø, T. H., Dysvik, B., Jonassen), nevertheless these models are seldom used in a predictive cell simulating context. As far as we know, there is currently no active research around whole cell simulation in Norway. From a methodological point of view it is clear that new methodological approaches that include molecular biology, cellular imaging, real-time kinetic analysis and network integrated analysis are required to progress in understanding the nature of signaling specificity. To keep track of and to quantify the complexity of pathways, a computational approach seems essential.

4. *MarFlow Sample Tracking*; June 2004 - Tracking samples throughout many different organisations which all use different labeling protocols and are located at different geographical locations is difficult. This R&D program aims at the creation of a sample tracking system. The system will offer a) a labelling protocol designed for storage and unique identification of samples integrating many different labeling techniques b) a decentralised storage capacity (every organisation can store the data locally) and c) a security model which will take into account the ethics of sample exchange. A second aspect of the project aims at offering integration and data exchange towards existing sample tracking systems and analysis programs. We believe that this project and associated effort will reduce the costs of future information systems as well as increase cooperation between different research groups. The longer term goal of this project is the development of one or more commercial products related to sample tracking in cooperation with interested partners.

5. Madjid Dehlgandi, Tor Flå, , Said H. Ahmed; *CodFormatics: Design of a bioinformatic system to assist the cod breeding program;* June 2004 - As input to the national codbreeding program, it is important to identify regions within the genome that are responsible for quantitative properties (QTL's). Obtaining these however is complicated by the huge amount of involved (environmental) factors. To be able to approach this problem we propose the creation of a bioinformatics tool that will a) help in analysing current datasets and b) help in guiding future experiments. E.g; by carefully selecting a set of fishes with the most desirable properties it might be possible to find the QTL much quicker than what would be possible by analysing all fish.

7.2 Application of Signal Processing

1. Werner Van Belle, Bruno Laeng; *Where are the Emotional Cues in Music ?* May 2006 - What are the underlying dimensions that give structure and meaning to music ? To answer this question, we aim to integrate methodological techniques from other disciplines (signal processing & mathematics) into the field of psychology and psycho-physiology. Our main goal is to measure in a mathematical and computational way musical parameters and relate those to the human judgment of a song its emotional content and in addition compare these to psycho-physiological measures (pupillometry and EEG).

2. Werner Van Belle, Bruno Laeng; *Designing Music Therapy: Developing Algorithms to Extract Emotion from Music*; November 2005 - The effect of music as a psychotherapeutic tool has been recognized for a long time. Alone, or in combination with classical treatment, music can alleviate depression, stress and anxiety, as well as acute and chronic pain. Such beneficial effects are likely to derive from its ability to induce mood changes. However, it remains unclear which aspects of music can cause emotional changes. This project aims to link advanced audio signal processing techniques to empirical psychoacoustic testing to develop algorithms that automatically retrieve emotions associated with a particular piece of music. Such algorithms could then be used to select and develop musical pieces for therapeutic purposes

3. Werner Van Belle, Bruno Laeng, Geir Davidsen; *Development and Integration of Algorithms that Extract Emotion from Music;* Mars 2005 - The described project aims to link advanced audio signal processing techniques to empirical psychoacoustic testing in order to develop algorithms that can automatically retrieve (part of) the emotions humans associate with music. The project is set up as a cooperation between 3 partners: Norut IT, the Psychology department at the University of Tromsø and the music conservatory at Hoyskolen in Tromsø. Commercial relevance of the project is found in audio content extraction for databases and search engines, quantitative assessment of emotion in music for teaching, automatic creation of playlists, categorizing sound libraries and plugins for sound production software used in studios.

7.3 Computer Science

1. Werner Van Belle, Lars K. Vognild, Tage Stabell-Kulø, Theo D'Hondt; *Trustnet: Scalable, Trusted Information Sharing for Ambient Applications;* June 2004 - Peer-to-peer systems are systems in which the gross of the data is directly communicated between hosts, without going through centrally placed servers. Typically, this kind of networks organize themselves automatically, thereby neglecting the actual network topology. This makes peer-to-peer systems a very attractive means to support ad-hoc networks, such as interconnected embedded devices. However, the peer-to-peer paradigm still poses a number of research problems. Among them scalability, finding useful information, security and the programming of applications in such volatile environments. The objective

is to address these problems by developing a scalable and secure peer-to-peer information sharing platform together with a suitable programming model.

2. Werner Van Belle, Wolfgang Demeuter, Theo D'Hondt - *Positie Optimalisering in Mobile Multi-Agent Systems;* September 1998, September 1999 - A research proposal submitted to the institute for science and technology in Belgium. Interaction between two agents on the same host is much faster than the same interaction between agents on different hosts. Because of this the performance of these systems can be finetuned by moving agents to the same location if they interacting sufficiently. In this study we want to develop the necessary algorithms to automate the distribution of mobile agents, with the main purpose of obtaining better global performance.

3. Werner Van Belle, Wolfgang Demeuter; *Object Gerichtheid en Message Passing in Wide Area Networks - Mogelijke Agent Strategien;* January 1997 & January 1998 - Submitted to the belgium national fund for scientific research

4. Chris van Bruwaene, Lode Nachtergale, Bart Wouters, Werner Van Belle - *MPG Research Project* - May 2001 - The research project is part of a transition toward a content-management system. This content management system should be able to manage all new and old media. This includes images, sound, text, graphics, games and interactive scenario's...). The development of a content management system implies a transition toward digital media. The MPG project is on one track responsible for doing this conversion, in such a way that releasing media on future communication channels (such as games via television) is facilitated (IMEC). On a second track all this media-content should be easily retrievable and automatically accessibly throughout whole the corporation. Therefore research is being conducted in component-based systems and ontologies (PROG). The total budget of this project is 2'478'940 EUR.

8 Academic Track

8.1 Teaching

1. Informatik-II (3e & 4e semester biosysteminformatik), Mathematische Anwendungen (4e sem telekom) & Databases (4& semester biosysteminformatik) at the Duale Hogschule Badem-Württemberg.

2. Exercises 'Distributed Systems' - given at the VUB, academic years 1998-2003 (5), for Marnix Goossens, aimed at the 2nd cycle of the standard computer science curriculum, the 2nd cycle of the applied computer science curriculum and the 3th year in teleinformatics.

3. Theory and Exercises 'Concurrent Systems' - given at the VUB, academic year 2000-2001 for Franklin Vermeulen, aimed at the 3th year computer science, Vesalius college.

4. Exercises 'theory of database systems' - given at the VUB, academic year 1998-1999 for Robert Meersman, aimed at the 3th year of computer science.

5. Exercises 'Graphics' - given at the VUB, academic years 1998-2000 (2), for Theo D'Hondt, as an optional course in the 2nd cycle of the computer science curriculum.

6. Exercises 'Algorithms and Data Structures' - given at the VUB, academic year 1998-1999 (1), for Theo D'Hondt, aimed at the 2nd year computer science.

7. Project guidance for a computer science course on Systems - given at ETH Zü rich, for Nessime Tatbul in cooperation with Nihal Dindar.

8.2 Adviser

8.2.1 Master Theses

1. User Interface for Mobile Agent; *Tan Jiaming;* 1997-1998

2. Print Spooling: a Critical Approach Toward a Specific Problem in a Hybrid Environment; *Dominique Kindt;* 1997-1998

3.* A Critical Evaluation of Distributed Collaborative Computer Applications; *Stefan Van de Velde;* 1997-1998

4.* A Study of Communication Models for Mobile Multi Agent Systems; *Karsten Verelst;* 1998-1999

5. Combining Components using Control Flow Components; *Philippe Demaecker*; 1999-2000

6. Applicability of Mobility, a Case Study; *Frederick Nyssens;* 2000-2001

7.* Shagger: a Distributed File Sharing Community with Transparent User Management and Adaptive Replication; *Wim Boffe;* 2000-2001

8.** A Strategy to Generate a Scheduler for Time Critical Programs by means of Finite State Machines; *Jessie Dedecker;* 2000-2001

9. Applications for Code Mobility on Handheld Devices; *Enzhen Luo;* 2000-2001

10. Synchronisation & Communication in Mobile Multi Agents Systems: CSP Revisited; *Jannes Pockele;* 2000-2001

11.* Using a Declarative Language to support Concurrency Management in Mobile Multi Agent Systems; *Kristof Van Buggenhout*; 2000-2002

12. Quality of Service for Mobile Multi Agent Systems; *Cedric Van Rykel*; 2001-2002

13. Reflection by means of JIT compilation; *Paul Henri van der Steichel*; 2001-2002

14. Distributed Application Serving using Mobile Agents; *Koen Bailleul;* 2001-2002

15.* Transparent Fault Tolerance for Mobile Multi Agent Systems; *Pieter Verheyden;* 2001-2002

16. [Sensor only] Distributed Transaction Management - A Simulation; Weihai Pan; 12 Dec 2004; Computer Science Department, Universiyt Tromso

8.2.2 Doctoral

1. Modularizing Advanced Transaction Management; Tackling Tangled Aspect Code; Johan Fabry

2. Jessie Dedecker with his Phd on Pervasive Applications

8.2.3 EU

Jury Member for CETRIL (Centre Européen de Transfert et de Recherche en Informatique Libre) in 2006.

9 Varia

9.1 Training Courses

1. Illumina Intermediate Course on Deep Sequencing Chesterford - 23 April 2008

9.2 Computer skills

Operating Systems: MSDOS, MS Windows (3.11, 95, 98, NT), Linux (Slackware, Debian, Gentoo), Solaris & SunOS

Programming Languages: Python, Jython, C, C++, Pascal, Prolog, Lisp, Scheme, Java (1.1.2, 1.1.8, 1.3.1, 1.4.0, 1.4.1), Pico, Borg; **Libraries:** QT, MFC,...

Middleware: OrbixWeb, Aglets, Voyager,...

Databases: MSAccess, MySQL, PostgressSQL...

Methodologies: UML (MSC's), OMT, Petri-Net Modelling, Room, Real-Time UML...

9.3 Student Organization: Infogroup

From November 1995 till December 1997 I was a board member of the student organization 'Infogroup'. This internal VUB organization was responsible for maintaining the computer rooms available to students, distributing course notes and maintaining a library of computer science books. I was active as system administrator and course manager. Key-points of this period:

May 94: Development of an *Ethernet packet sniffer* by patching the Linux Kernel.

Aug 96: Development of a client/server *Infogroup administration tool* under Linux in C using ncurses.

Feb 97: There were security problems at Infogroup due to an external hacker that broke into the mainframes of the University. We were wrongly accused of this, but risked loosing our network access anyway. I tracked the hacker by means of the before mentioned packet sniffer and a good knowledge of the network infrastructure.

May 97: Further securing of Linux kernel: root processes connected to a TTY can only work with TTY[123]. Other root processes are simply not scheduled, and thus not executed. This finally released us of all those remote script-kiddies.

Aug 97: Development of Scheme evaluator to serve the web. The evaluator itself is written in Java. The web-server is written in the evaluated language: Scheme. This way of working allowed us to create understandable server scripts and procedural HTML. I was team leader of 5 persons during this project.

Sep 97: *Tractebel* (a subgroup of Electrabel, which was Belgium its national electricity company) asked us for a black box security attack on their site. Due to a samba bug, I was able to access personal data on hard disks behind the firewall. However, since we already breached their defenses without a signed contract we were never payed (and as things are these days in 2007: we might be happy that we were not sued in return :).

9.4 Conference Organization

In 1998, the Programming Technology Lab of the VUB was responsible for the organization of ECOOP'98, a well known conference on software engineering by means of objects/aspects/components. I've been responsible for the setup and maintenance of the visitors computer rooms.