삼성 SDS의 Bioinformatics: 사업 및 연구/개발

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Abstract

- Overview of Bioinformatics and vision of Samsung SDS on it
- Overview of Bio Chip and its market
- Product roadmap with "Expert system for DNA chip data"
- "UniBIO" as an integrated package of DNA chip data analysis
- Demo of UniBIO

CV

2000년-현재: 삼성SDS 정보기술 연구소 Bioinformatics Lab. 연구원

2000년-2000년: 고려대학교 수학과 BK21(금융수학)

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1997년-1998년: 일본 나고야 메이조대학교 Post-Doc(확률론)

1990년-1997년: 서강대학교 이학박사(확률.통계학)

1990년-1993년: 육군사관학교 수학과 전임강사

1988년-1990년: 서강대학교 이학석사(수학과)

1984년-1988년: 서강대학교 이학사(수학과)

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발표 순서

- Overview of Bioinformatics
- Bio Chip
- Expert system for DNA chip
- UniBIO
- Demo

Overview of Bioinformatics

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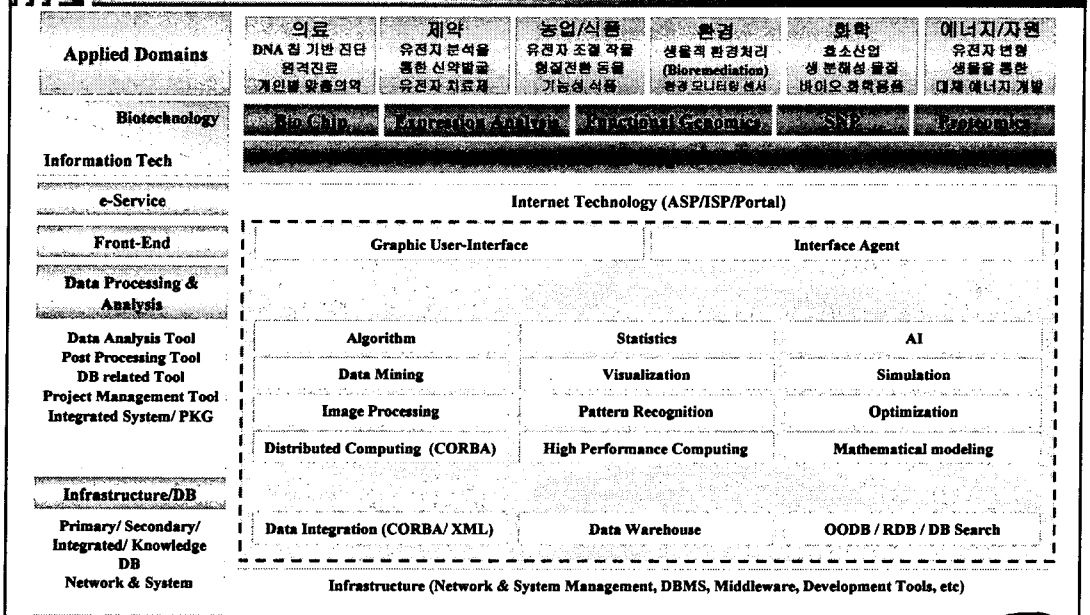
Overview of Bioinformatics



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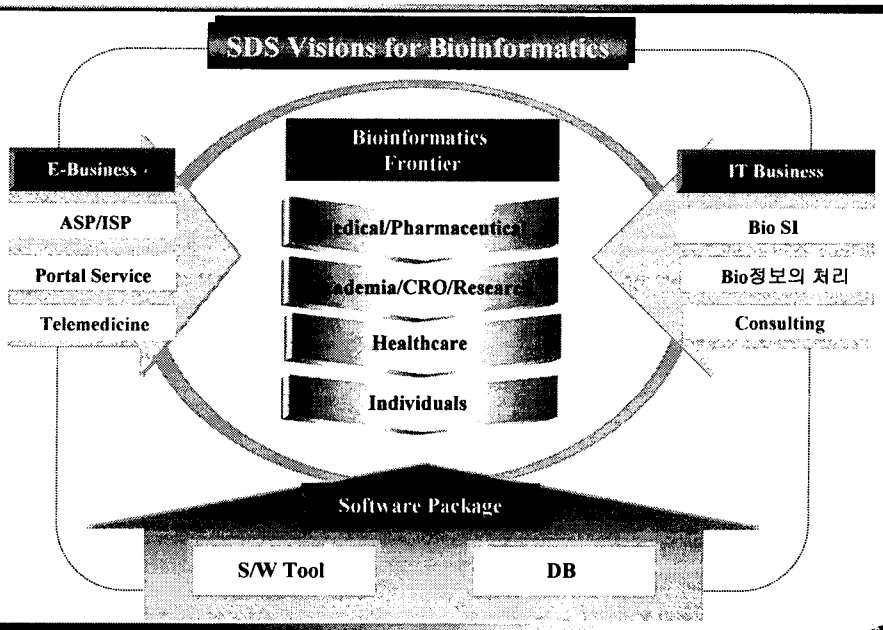
Vision of Samsung SDS on Bioinformatics



Vision of Major IT companies on Bioinformatics

Company	Viewpoint of BT	Action
IBM	We believe this will be a **very hot opportunity for IT** over the next decades	▪ **Customer: First Genetic Trust** ▪ **Life Science Div 설립** ▪ **Blue Gene 개발** ▪ **Bio consulting 사업 시작**
SUN	BT growth will more than replace any loss of dot-com revenue, especially, **the growth of computational resources and storage.** Needs will be very significant	▪ **Strategy: Deep discounts to Univ** ▪ **영국에 대규모 data center 설립** ▪ **Port DeCypher(TimeLogic)to Solaris OS** ▪ **Promote open platform on life-science based on *Java and XML***
Silicon Graphics	science research portion of SGI is 1/5 of all and **protein analysis** will produce much more data than we have today	▪ **3D visualization & data application tools**
Compaq	Major driving forces: ❑ IT investments on R&D by big pharmaceuticals and biotech companies ❑ Brand-new industry to supply information to pharmaceuticals and biotech companies	▪ **Celera Genomics/Sandia National Lab과 R&D 협력** ▪ **Invest $100million on genomics & bioinformatics company via venture capital** ▪ **Invest $10million in Geneva Proteomics**

Bio Chip

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Bio Chip Market

Segmentation	1999	2001	2004	Major Trends
Microarray	$232mill	$874mill	$2.6bill	Patent issue/Consolidation/ Acquisition/Higher density array/ Lab with their own microarray
Microfluidics	$17mill	$77mill	$305mill	Alliance with liquid handling (Aclara & Packard/ Gamera & Tecam)
Other Bio chip	$23mill	$81mill	$311mill	Protein chip(Ciphergen) NanoChip(Nanogen) SNP Detection(Sequonome) Probes(Clinical Micro Sensors)
Bio Chip	$272mill	$1.03bill	$3.3bill	**65% AGR (Annual Growth rate)**

Frost & Sullivan, May, 2001

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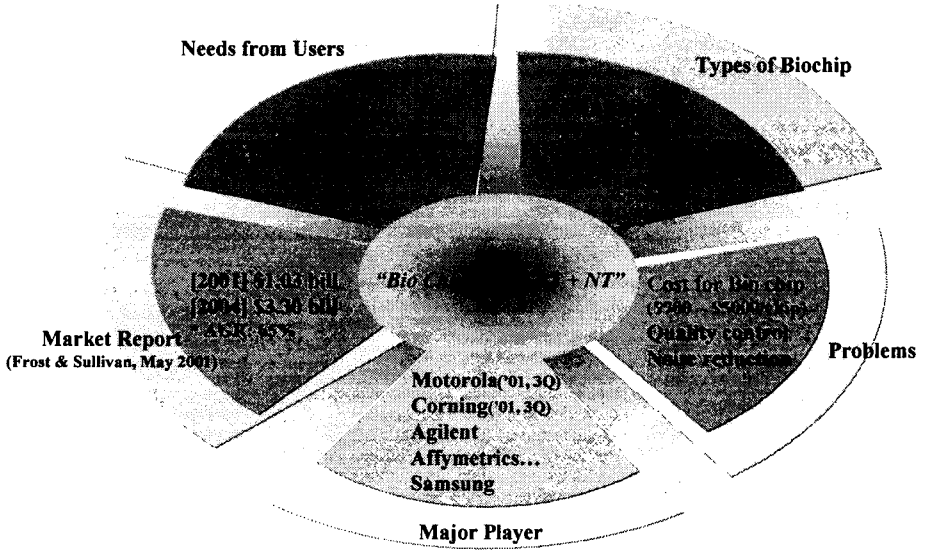
Major Bio Chip Player (Motorola)

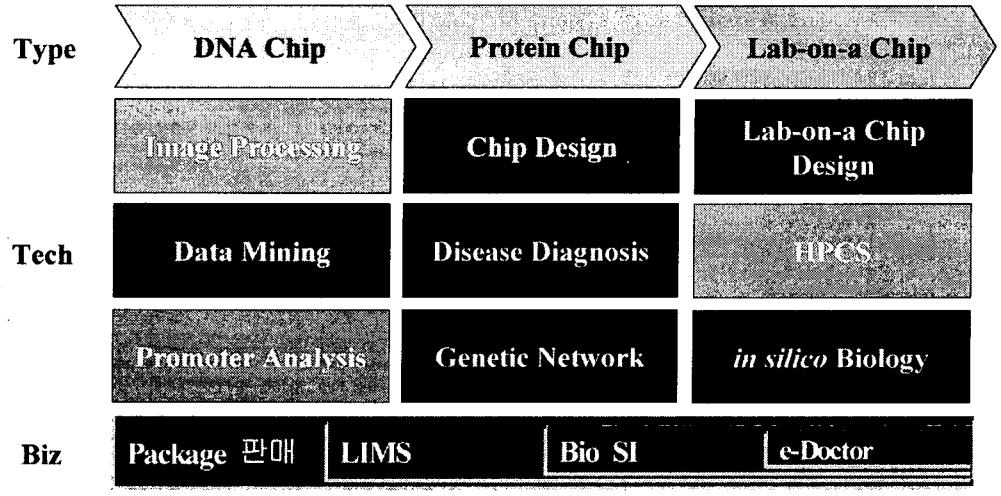
Motorola's Life Science	
Product Goal	Type: *Universal platform* for DNA-based testing "full value-chain from research to discovery to trials to diagnostics with different products targeted to different types of needs"
Target customers	Researchers/Diagnostics lab/*Large* doctor's office
Selling strategy	Mass production with *high costs*. but emphasis on *quality of chip*
Products	- CodeLink array for researchers with 10k human gene microarray (August)-mass production - Later: 10k *rat array(Oligo chip)*
Collaborator	**Compugen**: chip design service
Recent PJT	[DARPA] Microfluidics multi-chip-module genetic analysis sample preparation system

Overview of Bio Chip

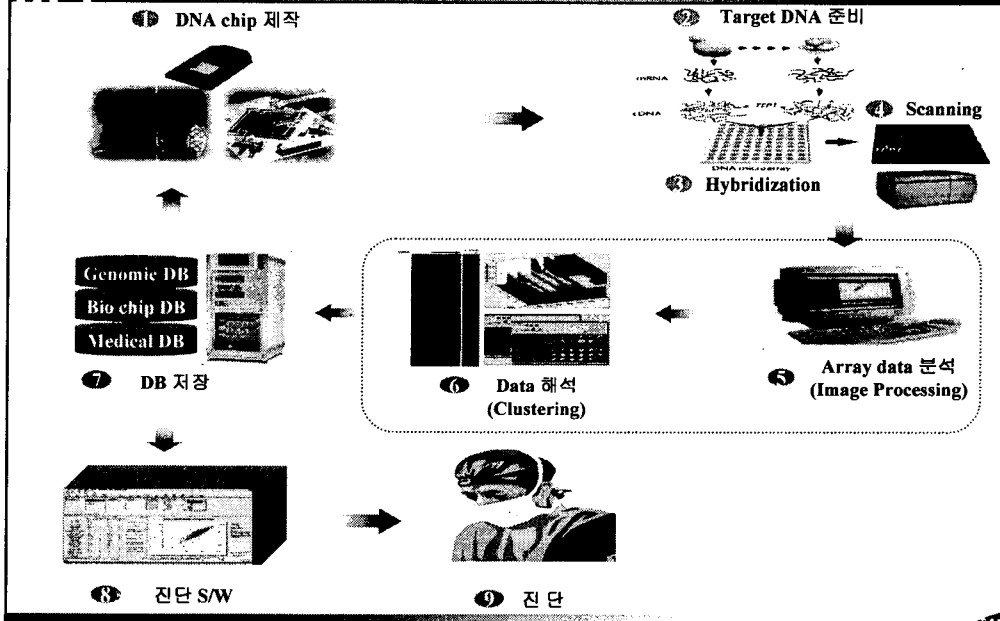


Expert System for Bio Chip

Tech. & Product Roadmap



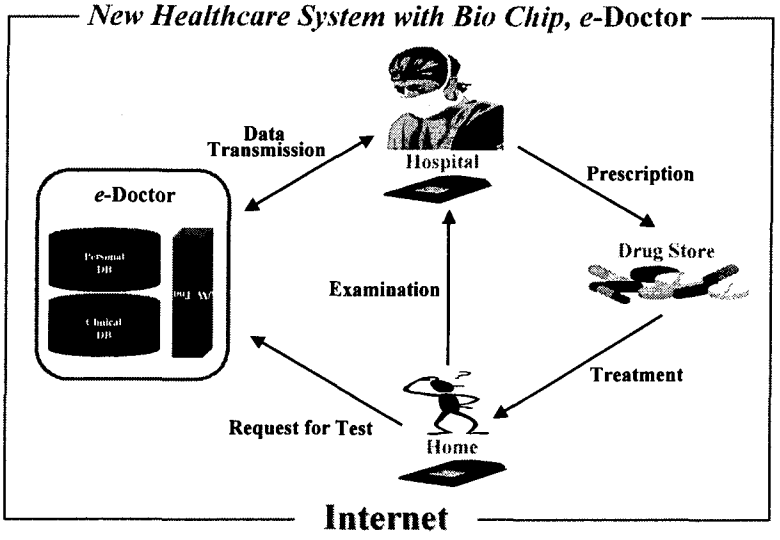
An application of DNA chip Analysis system



Microarray system

Chip Design	☐ **Problem: Which genes to put on the chip and Which probesused for each gene** ☐ **Process:** **- (cDNA) selecting a set of clones** **- (Oligo) design oligos for the regions of each gene you want to cover** ☐ **Informatics:** *AIMS/Heavy-duty sequence-analysis problem*
Chip Construction	☐ **(Input) chip layout (Output) A list of chip identifiers***(barcode)* ☐ **Process: clone or oligo picking → spotting on plates** ☐ **Informatics:** *LIMS + inventory and order management* **(Bookkeeping of many clones and oligos bought from supplying company)**
Data Acquisition	☐ **(Input) sample and chip** ☐ **Process: RNA extraction, labeling, hybridization, image capture** ☐ **Additional Information:** **- chip data from chip construction** **- sample data from sample acquisition LIMS***(manually)* ☐ *Wet phase*
Data Analysis	☐ **Image Processing** ☐ **Data Mining** ☐ **Informatics:** *AIMS*

e-Doctor: Healthcare system with Bio Chip



UniBIO

Integrated package for DNA chip data analysis

UniBIO의 특징

- Full integrated system for DNA chip data analysis
- Project management
- Automatic procedure with minimal user input
- Various file import/export
- Web interface (GenBank)
- User-friendly interface
- Batch process/Wizard
- JAVA and XML

UniBIO의 기능 (1)

Image Processing	Spot detection	❖ Manual segmentation ❖ Automatic segmentation
	Extract expression	Quantification Quality control
	Normalization	❖ Using control genes ❖ Inter-experiment normalization
	Chip quality validation	

UniBIO의 기능 (2)

Statistical Analysis	Quality control	❖ Filtering outliers ❖ Normalization procedures
	Test of differential expression	❖ Significance of test ❖ False-positive error control
	Cost/Benefit analysis	❖ Estimates number of replicates needed ❖ False-negative error control

UniBIO의 기능 (3)

Data Mining	Visualization	❖ Scatter plot ❖ Pattern graph ❖ Dendrogram
	PCA	Reduce number of dimension
	Data clustering	❖ K-Means ❖ SOM ❖ Hierarchical algorithm ❖ Bi-clustering
	Classification	❖ Classification ❖ Estimation ❖ Prediction ❖ Regression

UniBIO의 기능 (4)

Promoter Analysis	Promoter sequence extractor	❖ GenBank explorer ❖ Promoter extractor
	Promoter sequence analyzer	TF site search Motif edit TF site discovery TF site validation Promoter module search Promoter module discovery Promoter prediction

DEMO