NOKIA MORPH TECHNOLOGY

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ABSTRACT

Nokia Morph is the codename for the next generation smart phones that will feature flexible and stretchable OLED display. These displays can be folded easily and can fit easily in day to day life. Think of Morph as a snapshot of a new kind of mobility, made possible by a personal device that intelligently bridges local and global information. By sensing ambient elements, physical objects, and your individual context, the device adapts its form factor and functionality accordingly. Its appeal is undeniable: a wearable device that changes shape, detects toxins on your food, draws power from the sun, and repels a drop of honey. Morph isn't a product you can buy tomorrow, but it isn't science fiction either.

Keywords-component-Nokia Morph, Nano grass

I INTRODUCTION

The "Nokia Morph" is a theoretical future device based on nanotechnology that might enable future communication devices. It is intended to demonstrate the flexibility of future mobile devices, in regards to their shape and form allowing the users to transform them according to their preference. It demonstrates the ultimate functionality that nanotechnology might be capable of delivering i.e. flexible materials, transparent electronics and self-cleaning surfaces. It also features nanosensors that can interact with the environment to provide key information for anything from temperature changes to pollution.

Nanotechnology enables materials and components that are flexible, stretchable, transparent and remarkably strong. Fibril proteins are woven into a three dimensional mesh that reinforces thin elastic structures. The nanoscale mesh of fibers controls the stretching when the device is folded. The surface of morph is super hydrophobic which makes it extremely direpellent. Nanoscale grass harvests solar energy which could be used for recharging batt erySince the **KAIST**, developed a transparent resistive random access memory (TRRAM), the idea of morph technology seems to be growing. By integrating TRRAM device with other transparent electronic components, we can create a total see-through embedded electronic system which became the major platform for Nokia morph technology.

1.1 History

The concept of NOKIA MORPH has been introduced to the global world at the Museum of Modern Art (MoMA) in New York City from February 24 to May 12 of 2008 as part of the "Design and the Elastic Mind" exhibition. The concept emerged through collaboration between Nokia Research Center and Cambridge University Nanoscience Center in the UK. Since the KAIST, developed a transparent resistive random access memory (TRRAM), the idea of morph technology seems to be growing and Nokia Research Center collaborated with Cambridge University Nanoscience Center and initiated to develop this fairytale concept a reality and researches are still undergoing. Nokia also added a concept video regarding morph on YouTube which received 2.3 million viewers on its initial week. This technology enabled phones are expected to reach the global markets around 2020.

1.2 Mobile Gateway

The mobile device works at the center of our everyday life, interconnecting local intelligence-temperature changes, air pollution, our heart rate-with needed information and services. Mobile devices together with the intelligence that will be embedded in human environments – home, office, public places – will create a new platform that enables ubiquitous sensing, computing, and communication. Core requirements for this kind of ubiquitous ambient intelligence are that the devices are autonomous and robust. They can be deployed easily, and they survive without explicit management or care. As shown in FIG 4, mobile devices will be the gateways to personally access ambient intelligence and needed information.

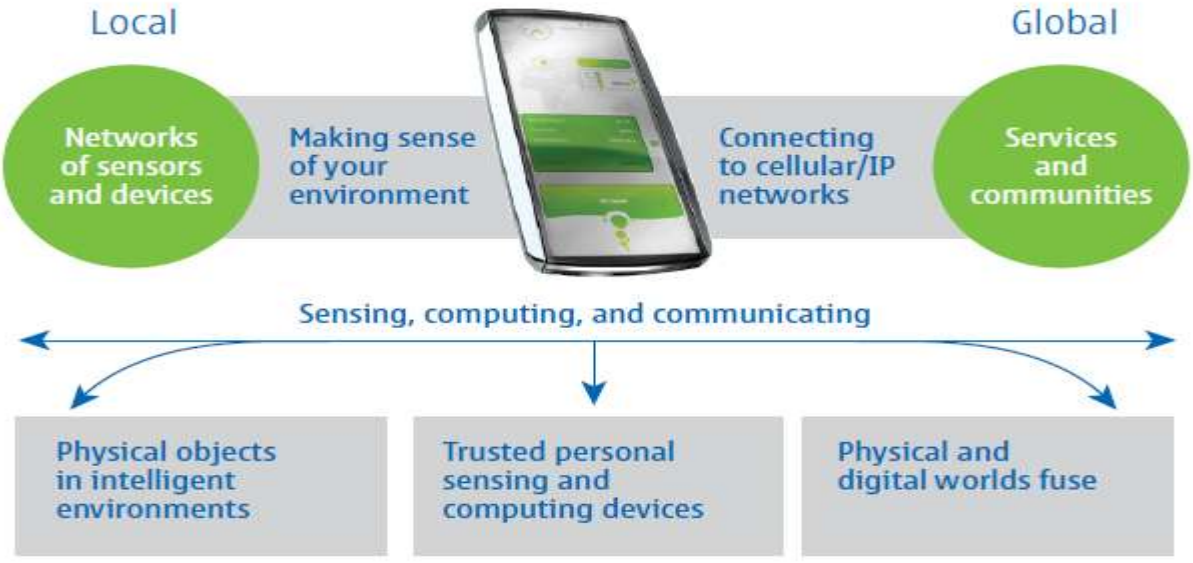

Fig 1: Mobile Devices Become Gateways To Ambient Intelligence And Needed Information.

II NANOTECHNOLOGY

Nanotechnology means “The science, engineering and technology related to the understanding and control of matter at the length scale of approximately 1 to 100 nanometers”. Nanotechnology was first introduced in 1959 by Richard Feynman. Nanotechnology is an umbrella term that encompasses all fields of science that operate on the nanoscale. Nanotechnology is an extremely diverse and multidisciplinary field, ranging from novel extensions of conventional device physics, to completely new approaches based upon molecular self-assembly, to developing new materials with dimensions on the nanoscale. Nanotechnology allows control of physical properties of nanostructures and devices with single molecule precision. Development of nanotechnologies creates a new basis for solutions and systems in sensing & actuation, memory, information, signal processing and communication. It creates miniaturized, power efficient technologies for the future mobile, multimedia and computers and also enables intelligent systems that can be embedded into human environments. Nanotechnologies also provide a new generation of added value products and services with superior performances across a range of applications.

Two main approaches are used in nanotechnology. In the "bottom-up" approach, materials and devices are built from molecular components which assemble themselves chemically by principles of molecular recognition. In the "top-down" approach, nano-objects are constructed from larger entities without atomic-level control.

III FEATURES OF NOKIA MORPH

3.1 SENSING

Nokia Morph can interact with the surrounding environment and is capable of providing key information for anything from temperature changes to pollution i.e. Morph can sense its surrounding. Nanosensors are used for this purpose and it empowers users to examine the environment around them in completely new ways, from analyzing air pollution, to gaining insight into bio-chemical traces and processes. New capabilities might be as complex as it may help us monitor evolving conditions in the quality of our surroundings, or as simple as knowing if the fruit we are about to enjoy should be washed before we eat it. Our ability to tune into our environment in these ways can help us make key decisions that guide our daily actions and ultimately can enhance our health. Nanostructures can also enable robust chemical and biochemical sensing, especially in scenarios where nanoscale values are being measured. And since nanoscale is the scale of the fundamental processes of life, nanoscale chemical sensors can leverage principles and materials common to biological systems. Nanosensors construct a complete awareness of the user context–both personal and environmental enabling an appropriate and intelligent response. In order to improve sensor and signal processing characteristics Nokia introduced Nanowire Lithography (NWL) process that fabricates a large area and self aligned 3D architectures.

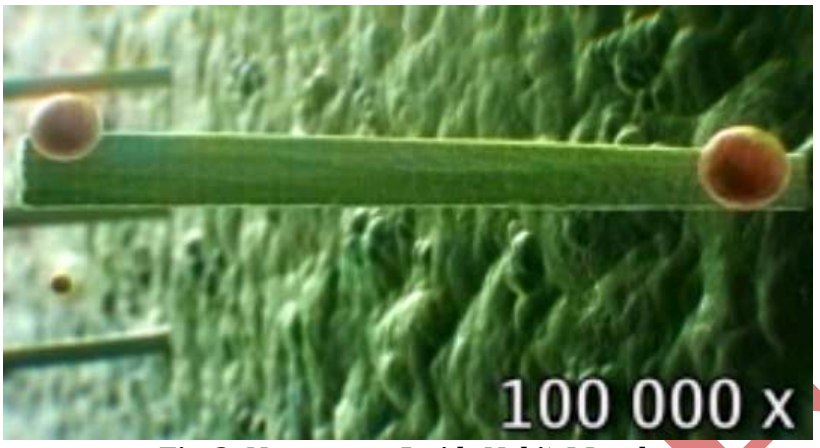

Fig 2: Nanosensor Inside Nokia Morph

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3.2 HAPTIC SURFACE

Touch sensitive and responsive (HAPTIC) surface of Nokia Morph is provided by large area sensing surfaces using piezoelectric nanowire arrays. ZnO nanowires are used to produce the piezoelectric nanowire arrays. Buttons on the device surface are in real 3D forms.

Fig 3: Haptic Surface Of Nokia Morph.

ZnO exhibits an unusual combination of properties, including uniaxial piezoelectric response and n-type semiconductor characteristics. Nokia is exploiting these qualities to achieve strain-based electromechanical transducers—ideal for touch-sensitive (even direction-sensitive) surfaces. Arrays of ZnO nanowires can be fabricated at low temperatures (70−100˚C), providing compatibility with polymer substrates, such as polyethylene terephtalate (PET). By coating a substrate (silicon, glass, or PET) with an array of these ZnO nanowires, the electrical signals on the surface can be activated by mechanical force. Since ZnO nanowires and nanoparticles are nearly transparent, this

technique can be used to develop compliant, touch-sensitive, active matrix arrays that sit on top of displays or other structural elements.

3.3 STRETCHABLE AND FLEXIBLE ELECTRONICS

Nokia are developing thin-film electronic circuits and architectures supported on elastomeric substrates which are robust enough to allow multi-directional stretching. Nanotechnology enables materials and components that are flexible, stretchable, transparent and remarkably strong. Fibril proteins are woven into a three dimensional mesh that reinforces thin elastic structures. This elasticity enables the device to literally change shapes and configure itself to adapt to the task at hand. Thus nanoscale structure of the electronics enables stretching.

A folded design would fit easily in a pocket and could lend itself ergonomically to being used as a traditional handset. An unfolded larger design could display more detailed information, and incorporate input devices such as keyboards and touch pads.

Fig 4: Stechable Electronics Of Morph

3.4 TRANSPARENT ELECTRONICS

The whole electronic circuit inside Nokia Morph is entirely transparent. Nanoscale electronics becomes invisible to human eye. The major platform for transparent electronics came into existence with the introduction of transparent resistive random access memory (TRRAM) developed by *Korean Advanced Institute Of Science And Technology (Kaist).*

Fig:TRRAM

By integrating electronic system could be developed. TRRAM records data by changing the resistance of a metal oxide film known as resistive RAM.

3.5 SELF CLEANING

We all have seen a water droplet that beads up on a lotus leaf, it is due to the hydrophobic nanostructures and this principle is known as super hydrophobicity. The surface of Nokia Morph is similar to this. Nanotechnology can be leveraged to create self-cleaning surfaces on mobile devices, which ultimately reduces corrosion, wear and improving longevity. Nanostructured surfaces known as "Nanoflowers" provide the hydrophobicity to Morph that naturally repel water, dirt, and even fingerprints. Double roughening of a hydrophobic surface, on the submicron and nanometer scale, creates superhydrophobicity.

Fig 6: Nanoflower

IV ADVANCED POWER SOURCES

Each and every mobile phone requires a power source. But in the case of morph it has got not one but many power sources. It has got an enhanced energy density battery that is quicker to recharge and is able to endure more charging cycles. Along with it polymer carbon nanotube composites with controlled conduction, nanotube enhanced super capacitors and nano composite solar cells also act as other power sources. Here nano enhanced dielectrics are used as separator and high power capacitors. Here energy is also harvested from RF using wideband antennas or by using nano electro mechanical (NEM) method. Microwatt level energy is harvested from waste energy in air. Nanograss is used for harvesting solar power. Nokia developed a full solid state, flexible Dye Sensitized Solar Cell (DSSC) using ZnO nanostructure that act as photovoltaic's which harvests solar energy.

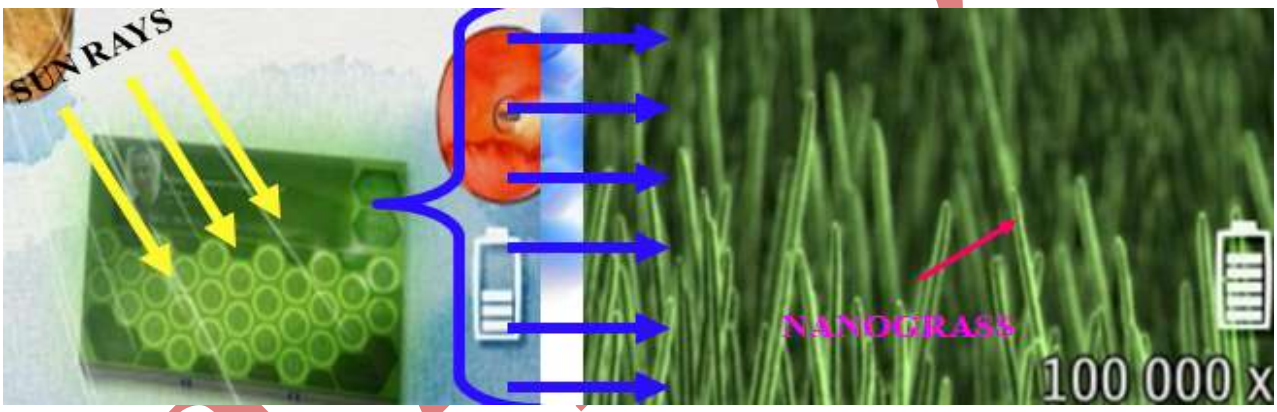

Fig 7:-Charging Process

V CONCLUSION

Think Morph as a snapshot of a new kind of mobility made possible through nanotechnology and along with Nokia Research as their slogan says "Thinking, understanding and creating mobile innovations for cultures all over the world" and Cambridge University Nanoscience research centre the Morph has the potential of being both evolutionary and revolutionary when applied to the field of mobile technology and with more it always be bonded and is always be connected to a range of objects and services that have not yet being imagined. Thus NOKIA MORPH is just a beginning to the future mobiles.

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