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A Touch of Reality

A look into Apple's 3D Touch technology and how hands on it's user interface is

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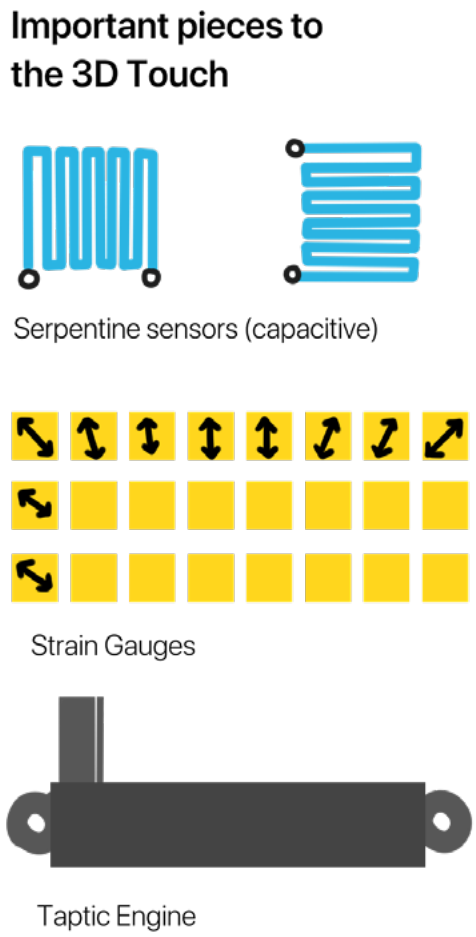
In June of 2007; Apple revolutionised the phone industry with the introduction of multi-touch touch screen technology. It is with this technology that Apple was able to close the gap between users and their devices, no longer was there a need for awkward input features on Apples as now users could directly interact and input their actions through this screen. However, with such innovation, we're led to wonder if Apple could take the touch screen to another level. Well, introducing the new touch screen technology; the **3D Touch**.

The 3D Touch was introduced by Apple in 2015. This technology offers users different way to interact with their devices as the touch screen was now tactile reliant. What this means is that the technology recognises the force being applied and submits different previews and gestures depending on the pressure being used. This allows for accurate and accessible usage for everyone alike. To understand exactly how 3D Touch works, we shall touch on touch screen technology and look at the layers that make up the 3D Touch.

Touchscreen technology detects user touch through its '**capacitance**'. To understand this, it means that whenever you use your finger or stylus to interact with the screen, the charge from the stimuli would change the specific point of contact. The screen processes this because the transmitting layer underneath the screen senses the change and transmits this to the sensing layer which is then signalled to the iPhone's processor. But how is this technology translated into the iPhone's 3D?

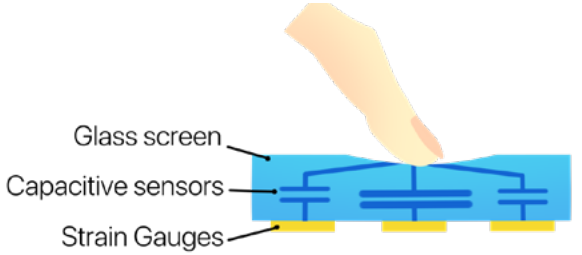
Well, with the addition of **microscopic sensors** within the phone's touch sensitive layers, it allows for the 3D Touch to sense the pressure being applied to the screen. To dissect the layers of the iPhone, it goes as follows. The touchscreen contains capacitive sensors that contain the previously mentioned microscopic sensors, these sensors can detect changes in the distance between the back light and cover glass. These capacitive sensors contain one of many **serpentine traces** which help register the applied force and send them to the ninety-six underlying **strain gauges**. The **strain gauges** are a flexible material



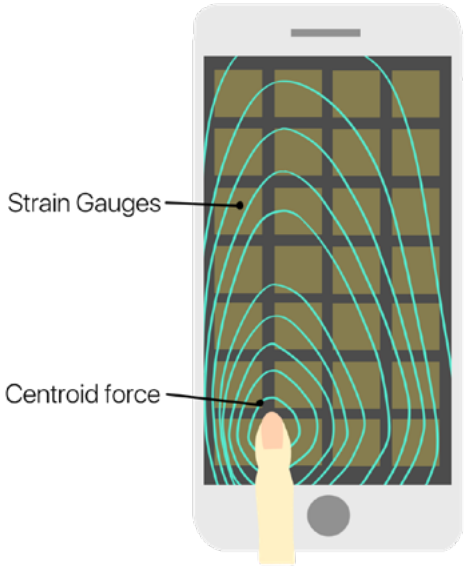
that have their electrical signal changed when an outside force bends it. These changes in signals are then calculated by each strain gauge and compare the amount of force applied with neighbouring gauges; this is called '**force centroid**'. What this does is that the gauges can relate the location and pressure of the force and send the information to the iPhone so it can determine what the user wants to do.

The sensory information is then sent to the **Taptic Engine**. The Taptic Engine is Apple's **haptic feedback machine**. This haptic technology can create a tactile experience for a user through various methods such as vibrations or motion. What the Taptic Engine does is it registers the information received from the strain gauges and acts upon this through haptic feedback. It applies the action the user inputted and complements this with vibration effects due to the engine containing a linear actuator.

But why is the 3D Touch important to the evolution of Apple's touch screen technology? Is it more than a gimmick and why should the average consumer care for such a feature? Well, with the 3D Touch, we're able to improve efficiency and productivity and helps users become more in touch with user-friendly features such as this. It is with developments such as this we're all led to wonder how else can Apple improve their technologies for the public?



Electrical charges are produced from the stimuli on the glass screen, information on the pressure applied is then processed by the capacitance and then sent to the strain gauges. All of this is then sent to the Taptic Engine for haptic feedback.



Depending on the amount of force being applied (Force centroid), neighbouring strain gauges will calculate the pressure and location of the force and send this to the Taptic Engine.

References:

Bloomberg Television News, production company. (2015). *How Apple's design studio made 3D touch technology.*

Oh, E., Hong, J., Cho, M., Choi, J. (2016). *Study on Behavioral Characteristics of 3D Touch in Smartphone.* ResearchGate. Retrieved from https://www.researchgate.net/publication/315630012_Study_on_Behavioral_Characteristics_of_3D_Touch_in_Smartphone

Chamary, J. (2015). *3D Touch In iPhone 6S Isn't Just A Gimmick. Here's How It Works.* Forbes. Retrieved from https://www.forbes.com/sites/jvchamary/2015/09/12/3d-touch-iphone-6s/#3c6252744cee

Purchur, J. (2015). *Apple's Reported 3D Force Touch is Fully Supported by a Patent.* Patently Apple. Retrieved from https://www.patentlyapple.com/patently-apple/2015/09/apples-reported-3d-force-touch-is-supported-by-a-patent.html

Anatomy of iPhone 3D Touch