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AUTO LAYOUT AN EXTERNAL MONITOR IN EXTEND MODE

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Auto Layout an External Monitor in Extend Mode

Abstract

The technique describes how a program running on a laptop/All-In-One computer to use build-in camera to detect user facing direction and angle to automatically allocate relative position of external monitor to primary monitor in extend mode.

Background

When connecting a laptop/All-In-One computer to a new displayer in Extend Mode, such as new monitor or a projector in a meeting room. It needs a manual step to config the relative location of external monitor to primary monitor. Following 2 manual steps connecting to external monitor:

1. Hardware-wise connect to external monitor.
2. Software-wise connect to external monitor. In operation system, hit specific hotkey to change display mode. In Microsoft Windows, hit [WIN]+[P] to change mode (refer to figure 1.1)
3. Go to setting page (figure 1.2) to config the position of second display.
4. Done

In general user scenario, for better user experience, the relative location would align with the physical location. Mouse cursor can move between primary screen and secondary screen smoothly.
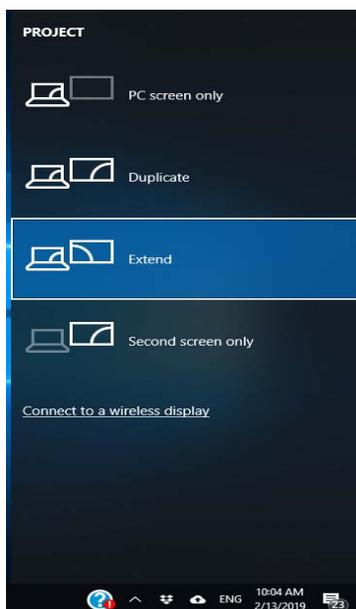

Figure 1.1 shows the Microsoft Windows GUI feedback when user hit the hot key to change display mode with external monitor.
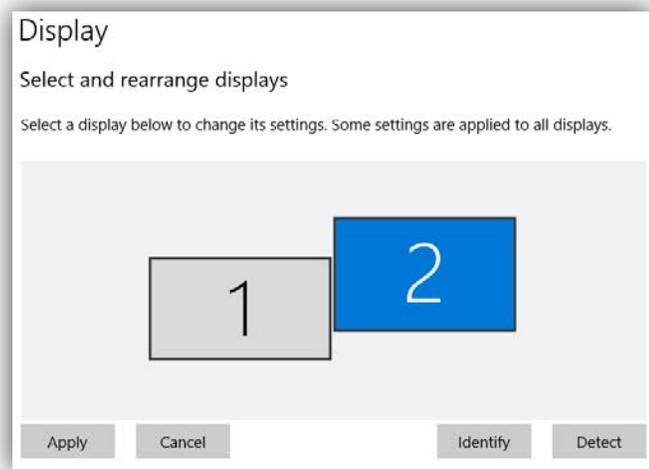

Figure 1.2 shows the interface Microsoft Windows user manually allocate the relative position of external monitor to primary monitor.

Motivation

Basically, some operation system remembers the location user set, for new connected monitor, operation system uses default location. If the configuration not aligns with physical location (most of cases are not yet config), user may suffer following failure scenario.

1. User move the mouse cursor to the edge of primary monitor and cursor lost unexpectedly. In fact, the cursor is lost, it's moving to the secondary screen.
2. User move the mouse cursor across the edge of primary monitor and expect the cursor move to secondary screen. Unfortunately, the cursor stops at the screen edge, user has to manually invoke the "Display" setting for manual configuration.

Solution 1

First solution is to pop up the "Display" setting for user to config the location if it's new connected display. The timing is when user presss hotkey and turns into extend-mode. Somehow, it's a little annoying that always ask user to confirm.

Solution 2

Investigate into human behavior during turnning into extend-mode, the first action he/she performs is looking at the external monitor to make sure content display successfully. This solution use the build-in camera to know the user's facing direction/angle and know the physical location. (Figure 1.3)

Almost all of laptop/All-In-One computers have camera for video call, login purpose or else purpose. It can be used to capture user's facing direction/angle. If there's depth camera, it would be more accuate, if there's only RGB camera, it's still workable to know the angle/direction by trained AI model without HW cost up.

If someone talk to user and cause the direction/angle not align with external monitor's physical location, which means the allocation is failed. User can go to Display setting to fix it (Figure 1.2). Since default configuration is very likely incorrect, the guessing failure is not worse than that.

To prevent the panic from guessing failure, allocating result should be presenting to user, if the guessing failure, keep pressing specific on screen FIX button (or hotkey) and swing the head to real time fix the position.
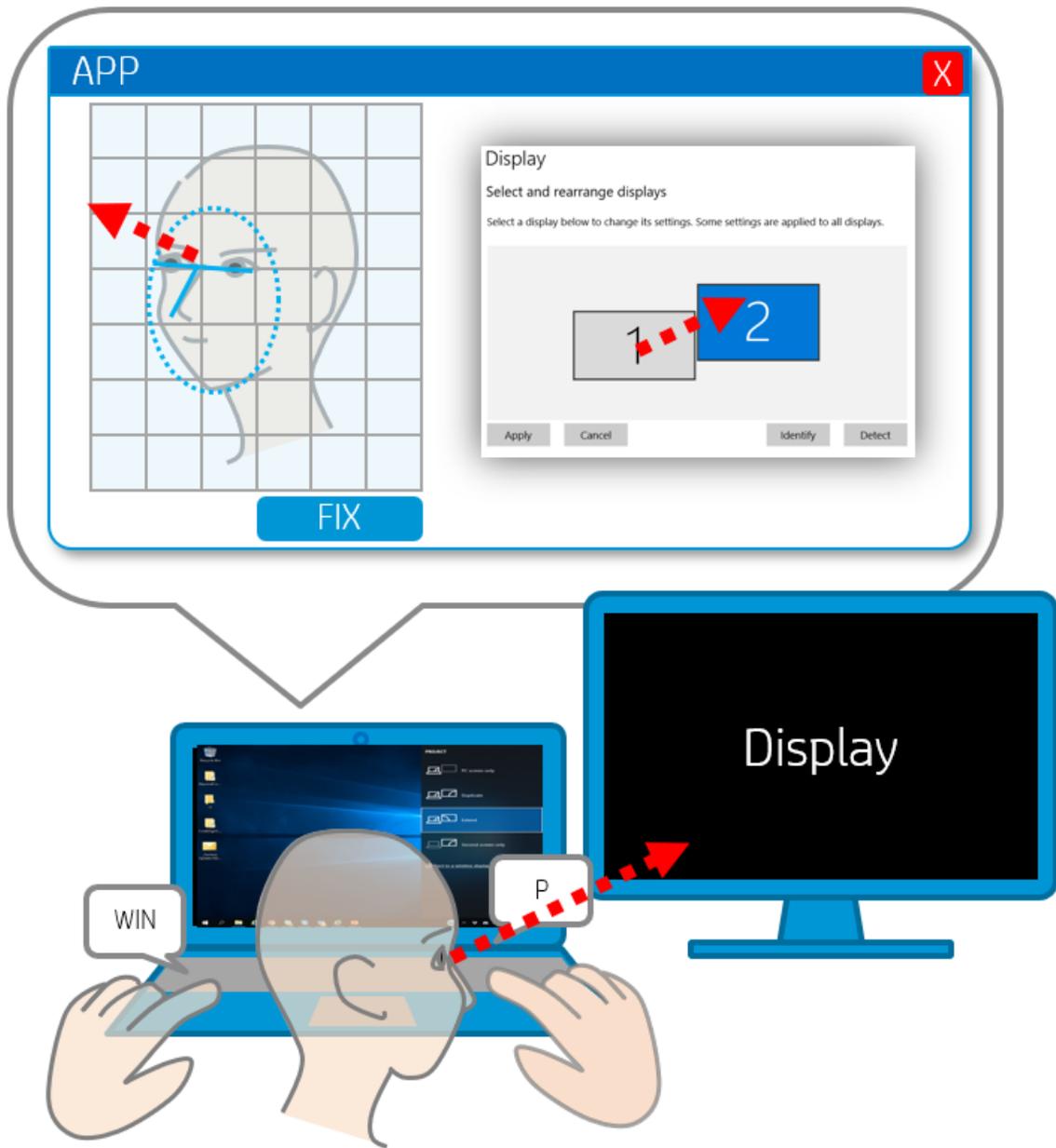
Figure 1.3, Solution 2, Detection and Fix

Disclosed by Tony Wu, HP Inc.