

Additional Case Studies

Car accident. A car accident usually closes at least one lane of the freeway and disrupts vehicle traffic. Figure 1 shows an example. The accident occurred at the white point. Given that vehicles passed this accident site slowly, the flow became almost standstill and the occupancy was low at the downstream. On the other hand, more and more vehicles queued into the traffic bottleneck over time so that the obstruction roughly appears as a triangle in our visualization. We also point out that the impeded vehicles were removed at around 9:50 so that the traffic flow recovered immediately. This example shows that traffic bottleneck caused by a car accident transited much faster than that caused by a large amount of vehicles. Analysts can investigate the cause that results in a traffic obstruction based on the visual patterns.

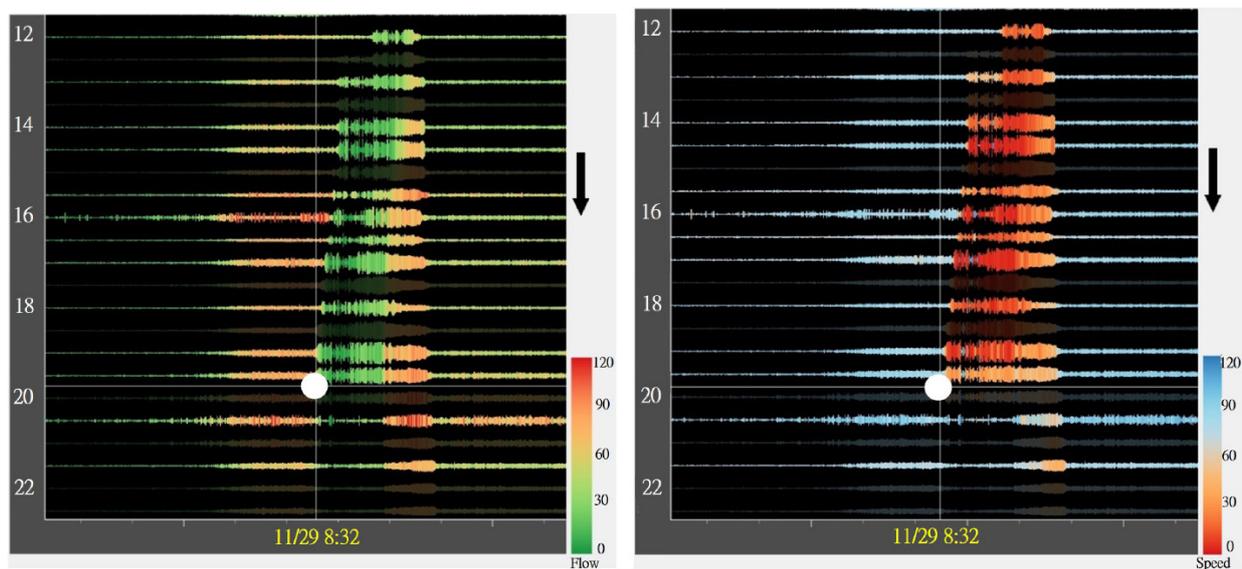


Figure 1: Left and right images show the flow and speed of a traffic bottleneck caused by a car accident. The spatial-temporal white point indicates the accident site. Therefore, the traffic situations upstream and downstream were very different.

Chinese New Year. Chinese New Year is an important long vacation in Taiwan. Most people spend the time with their families or visit scenic spots during the vacation. Therefore, the traffic situation is very different to that of working days and the event spans almost the whole freeway in Taiwan. Experts have to study the phenomenon at a global scale and predict the traffic situations in the coming vacation. Figure 2 shows the traffic flows from south to north (left) and from north to south (right) during the vacation (21 Jan. 2011 - 27 Jan. 2011). Given that there were more working opportunities in the north part than the south part of Taiwan, many people moved south in the first three days of this vacation to accompany their parents. As highlighted by the white rectangles,

the flow from north to south was much heavier than that of from south to north. In contrast, at the last three days of the vacation, the situation becomes opposite because people had to go back to work (highlighted by the blue rectangles). As for the middle four days in the vacation, the flows were heavy in both the directions because many people went out for sightseeing.

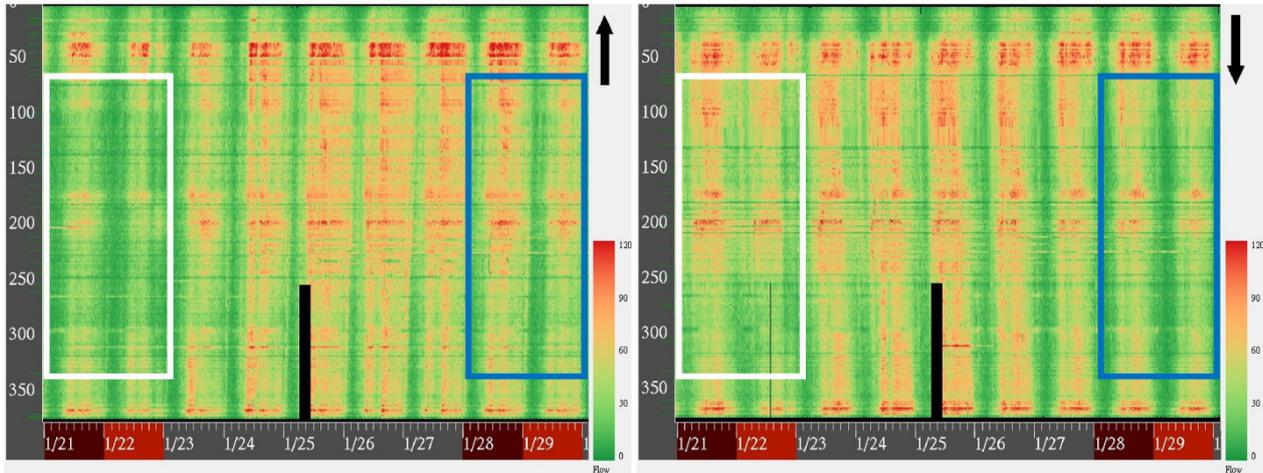


Figure 2: Left and right images show the traffic flows from south to north and from north to south during the Chinese New Year, respectively. Given that most people worked in the north part but their parents lived in the south part of Taiwan, they moved south and moved north in the first and the last three days of this long important vacation, respectively. Notice that the empty region is due to the wide range of data missing.

Tomb Sweeping Day. Another interesting event was tomb sweeping day, which was a traditional holiday for people to sweep the tombs of their ancestors. People moved between urban districts and countrysides in this one-day holiday and caused heavy traffic flows. Figure 3 shows the traffic flows from south to north (left) and from north to south (right). Generally, the three main urban districts in Taiwan covered the freeway mileages at 10-40, 160-180, and 330-370 kilometers. Therefore, southern part of the citizens moved north and northern part of the citizens moved south from around 6 AM for tomb sweeping. They then went back home from around 12 PM. As highlighted in white and blue rectangles, the traffic flows were opposite in the morning and in the afternoon.

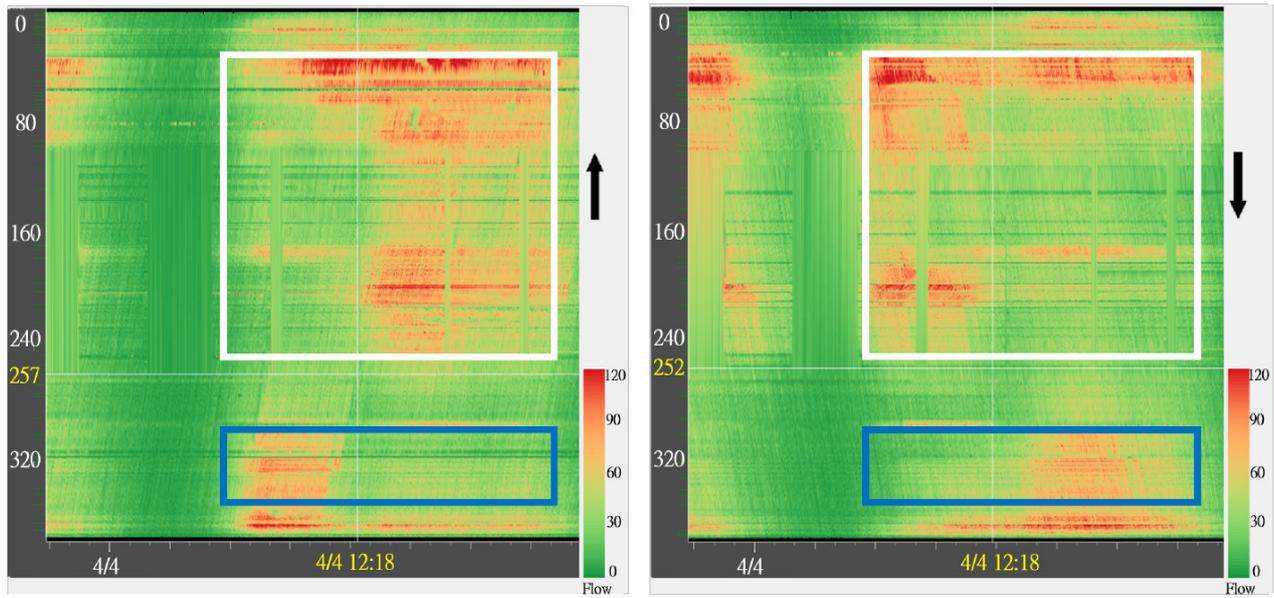


Figure 3: Left and right images show the traffic flows from south to north and from north to south, respectively. Given that citizens moved between urban districts and countrysides for sweeping tombs in this one-day holiday, the traffic flows were opposite in the morning and in the afternoon.