汉译英:

读懂高铁技术

在2008年8月份之前，高速铁路对我们而言还只是想象，只能从图片或者视频上羡慕国外高铁列车的飞速快捷。而北京至天津城际铁路的开通，让中国迅速跨进了高铁时代。根据国际铁路联盟（UIC）的定义，时速200~400公里/小时的铁路称之为高速铁路。高速铁路的研究，以法日德三国为领军人物，三个国家都是独立研发高铁技术，既有共同点，又有很大区别。日本的高铁是新干线模式，全部修建新线；法国的高铁TGV模式，部分修建新线，部分对既有线提升改造；德国的高铁是ICE模式，大部分提升改造既有铁路，少量修建新线。除了上述三国之外，英国对高铁技术也进行了研发，采用APT模式，不修建新线，全部对既有线路的提升改造，开行摆式列车。而中国的高铁技术是将法日德等国家的先进技术买断之后，重新研发、自主创新，形成了独特的高铁技术，并且后来居上，取得了瞩目的成就。

高铁速度快、运行平稳，安全可靠，那么到底是哪些要素决定了高铁比普通铁路甚至其他交通工具更加先进呢？影响高铁的技术因素都有哪些呢？让我们一一道来。

我们知道，火车在直线上运动的速度总比在曲线上要快，这是因为火车在经过曲线之时会产生离心力，若速度太快，就会造成列车脱轨酿成事故。曲线半径越小，则列车通过速度越低；曲线半径越大，列车通过速度越高，当曲线半径无限大之时，就变成了直线。因此曲线半径是影响高铁运行速度的第一要素。为了满足高铁列车速度达到350公里，曲线半径最小不能小于7000米，一般采用9000~10000米最合适。铁路线路从直线过渡到曲线，需要设一个过渡段，称之为缓和曲线，目的就是不让列车在曲线和直线之间硬性过渡，以免影响乘客的舒适度，缓和曲线根据列车速度进行计算确定。曲线和曲线之间不能直接衔接，需要加一段直线，称之为夹直线。夹直线的长度也是根据计算确定出来的。

除了高铁线路平面要满足一定的技术条件之外，线路坡度也有一定限制，理想条件下，高铁全线都是平坡最好，但是因为经过的地域不同，各地海拔也一样，全线平坡根本不可能实现，遇见高铁线路跨越障碍物，就需要上坡下坡，这就对坡度提出了要求。目前，我国高铁的最大纵坡不能大于千分之25，也就是说，

列车走行 1 公里远，爬坡高度不大于 2.5 米。两个相邻的坡度之差也有一定限制，不能超过规定的限值，否则一来会降低列车的舒适度，二来容易造成列车脱轨。

高铁经过曲线地段，由于离心力很大，会造成车轮摩擦钢轨，同时让旅客感觉非常不舒服，为了减少钢轨磨耗和提高舒适度，就需要在曲线地段设置超高，就是曲线地段的外侧钢轨比内侧钢轨要高出一截，用以平衡列车的离心力，这个高出的数值就是超高值，一般采用 120 毫米，最大不超过 180 毫米。

高铁一般都采用双线，这样来往列车可以各行其道，不会造成交叉干扰，增加通过能力。那么两条线路之间的距离是如何控制的呢？线路间距过小，对向列车错车之时，产生的巨大风压就会压碎车窗，给乘客带来危险，甚至两个列车的车厢会撞在一起。线路间距过大，使得填筑路基宽度加大，占用土地就越多，会造成投资浪费。因此，选择确定合理的线间距是非常必要的，既要满足列车安全运行，又要经济上合理。确定两条线路的线间距，首先要满足两条线路上车辆的安全界限，简称车辆限界，其次还要满足列车对向错车之时产生的风压不对列车造成破坏。经过大量的试验及计算，确定高铁两条线路之间的间距采用 5 米。上述这些平纵面要素，说保证高铁安全快速的最基本条件。

英译汉：

Future of Intelligent Transportation Systems

Congestion, accidents, and pollution issues due to transportation are becoming more severe as a result of the tremendous increase in various travel demands, including vehicular traffic, public transportation, freight, and even pedestrian traffic. To resolve such issues, ITSs have been developed that are able to integrate a broad range of systems, including sensing, communication, information dissemination, and traffic control. Three essential components are necessary for any ITS to perform its function(s): data collection, data analysis, and data/information transmission.

From the reviews in the previous section, it may be seen that the future of ITS falls within the multiple layers of the connected environment (i.e., cyber, social and physical). Given this understanding, this section aims to provide some insights into the development of future ITSs and smart cities that include: analysis of information from cyber sources, CSP network modeling, and flow models in a connected environment.

1. Analyzing public attitudes and perceptions from cyber sources. Apart from the physical data that could be collected by various sensors, public attitudes and perceptions gathered from cyber sources (e.g., social networks) are the other promising sources of data for understanding a city's status and the performance of its transportation system. Thus, future ITSs should use these data sources to monitor and manage the systems. To extract useful and meaningful information from social network data sources, a natural-language processing (NLP)-based algorithm that adopts predefined semantic structures is suggested for data analysis. The NLP algorithm should be able to detect social events and/or public comments that could lead to potential traffic issues (e.g., congestion after a football match), or reveal public attitudes toward and perceptions of the transport system/current policy. In addition, with temporally and spatially tagged social network data, the extent and seriousness of traffic issues (e.g., comments on the delay of train service after an 8 AM train disruption) could also be estimated.
2. CSP traffic network modeling. To better incorporate the data from the CSP spaces and other emerging multi-source data, a CSP model should be developed to allow for the association and fusion of data. In the future, a hierarchical traffic net- work model that integrates physical, semantic, logical and perceptual networks in the digital reconstruction of CSP spaces should be considered. A cross-layered (i.e., between the cyber, social, and physical layers) network connection could be enabled by cognitive computing and/or probabilistic inference models to depict network connectivity. The association rule of cross-domain data could be investigated using statistics and NLP. For instance, the spatiotemporal association rule could be set between Bluetooth intensity and traffic volume, or building energy usage and pedestrian flow. In formulating this hierarchical traffic network model, due to the abundance of available traffic information, it will be crucial to identify and define the types and amounts (in terms of temporal and spatial resolution) of information that will be sufficient to implement various services effectively.

3. Flow models under connected environments. With the increasing popularity of VACS, it is certain that future ITSs will be applied in connected environments with mixed CAVs and RHVs. As the behavior/characteristics of CAVs are substantially different from those of RHVs, it is critical to understand the flow characteristics of such mixed-vehicle environments for use in ITS. Extended vehicular flow models will be necessary at both the microscopic and macroscopic level. At the microscopic level, new car-following (CF) models will be considered with the intention of incorporating the CAV-related characteristics (e.g., unreliable vehicular communications, communication delay, platooning driving protocols, penetration rate of CAVs, etc.). Such CF model could then be used in the design of link-based control in ITS. In contrast, at the macroscopic level, the CAV-related characteristics should be considered in the development of the network-level flow model to help in regional monitoring and planning (e.g., monitoring the congestion level of a district, designing cordon-based road pricing scheme, etc.).