FOREIGN ANIMAL AND ZOONOTIC DISEASES REPRESENTED USING VISUAL ANALYTIC TECHNIQUES

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Abstract: A zoonotic disease is defined as a disease shared between humans and animals through which a person is infected directly or indirectly. Direct contact with the environment or via insects such as fleas, flies, mosquitoes, or ticks or indirect contact through close contact between people and animals provides a mechanism of transporting diseases such as plague, rabies, West Nile virus, salmonellosis, and brucellosis. According to the Centers for Disease Control and Prevention (CDC), at least 60 percent of all human pathogens are zoonotic and 75 percent of the recently emerging infectious diseases that affect human originate from animals. Among the diseases categorized by the CDC, the most dangerous animal diseases pose risks to human health, livestock, and the agricultural economy, which provides about 13 percent of jobs in the United States and about $1 trillion annually in economic activity. The National Center of Foreign Animal Zoonotic Disease Defense (FAZD) founded in 2004 as a Department of Homeland Security (DHS) Center of Excellence (COE) focuses on research, education and outreach to prevent, mitigate, recover, and detect foreign animal and zoonotic diseases. Although research has revealed much knowledge concerning the type and vectors of foreign animal and zoonotic diseases, the prevention and detection of them still requires improved characterization and advances in analysis and educational systems. The FAZD Center is developing tools to meet this need, including computer models to simulate animal diseases outbreak under various scenarios, information dashboard technology to capture, organize and display real-time data to enhance early responses to disease outbreaks, and “epinomic” analysis, which combines high-level economic analysis with epidemiologic computer simulations to identify the best strategies for an effective response. Visual analytics is defined as the science of analytical reasoning facilitated by visual interactive interfaces, in which data transformations and representations for computation and visualization, analytic reporting, and technology transition assists with advances in science and technology developments. We are using visual analytics techniques as models for studying the prevention, detection, and recovery mechanisms of foreign animal and zoonotic diseases. A major disease outbreak could result in many uncertainties that leave emergency workers and responders with decisions about the most appropriate and most effective tools and strategies necessary to control the outbreak while the damage to human health, livestock, and the economy is minimized.

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