

client device **30**, while reusing the visual controls' application logic and visual input/output capabilities. In view that the controls **306** can be associated with the visual controls **302** whereat the application logic can be coded, controls **306** may be hereinafter referred to as "companion controls **306**" and the visual controls **302** be referred to as "primary controls **302**". It should be noted that these references are provided for purposes of distinguishing controls **302** and **306** and are not intended to be limiting. For instance, the companion controls **306** could be used to develop or author a website that does not include visual renderings such as a voice-only website. In such a case, certain application logic could be embodied in the companion control logic.

[0066] An exemplary set of companion controls **306** are further illustrated in **FIG. 10**. The set of companion controls **306** can be grouped as output controls **308** and input controls **310**. Output controls **308** provide "prompting" client side markups, which typically involves the playing of a pre-recorded audio file, or text for text-to-speech conversion, the data included in the markup directly or referenced via a URL. Although a single output control can be defined with parameters to handle all audible prompting, and thus should be considered as a further aspect of the present invention, in the exemplary embodiment, the forms or types of audible prompting in a human dialog are formed as separate controls. In particular, the output controls **308** can include a "Question" control **308A**, a "Confirmation" control **308B** and a "Statement" control **308C**, which will be discussed in detail below. Likewise, the input controls **310** can also form or follow human dialog and include a "Answer" control **310A** and a "Command" control **310B**. The input controls **310** are discussed below, but generally the input controls **310** associate a grammar with expected or possible input from the user of the client device **30**.

[0067] Although the question control **308A**, confirmation control **308B**, statement control **308C**, answer control **310A**, command control **310B**, other controls as well as the general structure of these controls, the parameters and event handlers, are specifically discussed with respect to use as companion controls **306**, it should be understood that these controls, the general structure, parameters and event handlers can be adapted to provide recognition and/or audible prompting in the other two approaches discussed above with respect to **FIGS. 7 and 8**. For instance, the parameter "ClientToSpeechEnable", which comprises one exemplary mechanism to form the association between a companion control and a visual control, would not be needed when embodied in the approaches of **FIGS. 7 and 8**.

[0068] In a multimodal application, at least one of the output controls **308** or one of the input controls **310** is associated with a primary or visual control **302**. In the embodiment illustrated, the output controls **308** and input controls **310** are arranged or organized under a "Question/Answer" (hereinafter also "QA") control **320**. QA control **320** is executed on the web server **202**, which means it is defined on the application development web page held on the web server using the server-side markup formalism (ASP, JSP or the like), but is output as a different form of markup to the client device **30**. Although illustrated in **FIG. 10** where the QA control appears to be formed of all of the output controls **308** and the input controls **310**, it should be understood that these are merely options wherein one or more may be included for a QA control.

[0069] At this point it may be helpful to explain use of the controls **308** and **310** in terms of application scenarios. Referring to **FIG. 11** and in a voice-only application QA control **320** could comprise a single question control **308A** and an answer control **310A**. The question control **308A** contains one or more prompt objects or controls **322**, while the answer control **310A** can define a grammar through grammar object or control **324** for recognition of the input data and related processing on that input. Line **326** represents the association of the QA control **320** with the corresponding primary control **302**, if used. In a multimodal scenario, where the user of the client device **30** may touch on the visual textbox, for example with a "TapEvent", an audible prompt may not be necessary. For example, for a primary control comprising a textbox having visual text forming an indication of what the user of client device should enter in the corresponding field, a corresponding QA control **320** may or may not have a corresponding prompt such as an audio playback or a text-to-speech conversion, but would have a grammar corresponding to the expected value for recognition, and event handlers **328** to process the input, or process other recognizer events such as no speech detected, speech not recognized, or events fired on timeouts (as illustrated in "Eventing" below).

[0070] In general, the QA control through the output controls **308** and input controls **310** and additional logic can perform one or more of the following: provide output audible prompting, collect input data, perform confidence validation of the input result, allow additional types of input such as "help" commands, or commands that allow the user of the client device to navigate to other selected areas of the website, allow confirmation of input data and control of dialog flow at the website, to name a few. In short, the QA control **320** contains all the controls related to a specific topic. In this manner, a dialog is created through use of the controls with respect to the topic in order to inform to obtain information, to confirm validity, or to repair a dialog or change the topic of conversation.

[0071] In one method of development, the application developer can define the visual layout of the application using the visual controls **302**. The application developer can then define the spoken interface of the application using companion controls **306** (embodied as QA control **320**, or output controls **308** and input control **310**). As illustrated in **FIGS. 10 and 11**, each of the companion controls **306** are then linked or otherwise associated with the corresponding primary or visual control **302** to provide recognition and audible prompting. Of course if desired, the application developer can define or encode the application by switching between visual controls **302** and companion controls **306**, forming the links therebetween, until the application is completely defined or encoded.

[0072] At this point, it may be helpful to provide a short description of each of the output controls **308** and input controls **310**. Detailed descriptions are provided below in Appendix B.

[0073] Questions, Answers and Commands

[0074] Generally, as indicated above, the question controls **308A** and answer controls **310A** in a QA control **320** hold the prompt and grammar resources relevant to the primary control **302**, and related binding (associating recognition results with input fields of the client-side markup page) and