

## **IntelliServe™: Automating Customer Service**

**Yannick Lallement<sup>1</sup> & Mark S. Fox<sup>1,2</sup>**

<sup>1</sup>Novator Systems Ltd  
203-444 Yonge St., Toronto Ontario M5B 2H4 CANADA  
Tel: +1-416-260-5131; Fax: +1-416-260-5121

<sup>2</sup>Enterprise Integration Laboratory, University of Toronto  
4 Taddle Creek Road, Toronto, Ontario M5S 3G8 CANADA  
Tel: +1-416-978-6823; Fax: +1-416-971-2479

[yannick@novator.com](mailto:yannick@novator.com), [msf@eil.utoronto.ca](mailto:msf@eil.utoronto.ca)

### **Why automate?**

Internet shoppers expect immediate responses to their inquiries and take their business elsewhere when they have to wait for answers. As the quantity of goods and services purchased electronically continues to grow, so does the need for better customer service.

Customer service provided over the internet is surprisingly poor. Requests for information or answers to questions often take days - if they are responded to at all. Call center personnel responding to internet customers may have little knowledge of the internet or their online operations. Inadequate training may result in delayed and inaccurate or irrelevant responses!

During burst-demand situations when holiday shopping is at its peak, it is impossible to hire and adequately train enough people to provide immediate, relevant and consistent responses to customers. Service is sacrificed when you need it the most.

For corporations to profitably sustain their growth in e-commerce, they must first resolve these customer service issues. Automating customer support as much as possible is one way to alleviate all the problems at once.

### **The alternatives**

The two most common customer service systems are e-mail management systems and those that provide live interaction with customer service representatives on the Web. Both are intended to make it easier and faster for consumers and customer service representatives to interact over the Internet. These systems are equivalent to existing call center management systems. Both require 100% human intervention.

### **IntelliServe's solution**

Novator's IntelliServe system automatically answers most customer e-mail without the intervention of a customer service representative. Response is immediate, regardless of the number of incoming requests for information. Furthermore, IntelliServe can interpret

natural language inquiries and responds with relevant and consistent answers. Inquiries that cannot be automatically answered are referred to a customer service representative.

## **Technical Brief**

### **IntelliServe's Architecture and Functionality**

#### **Message Types**

IntelliServe's modular architecture can be tailored to answer different types of customer messages automatically. When a customer's e-mail is received, it is classified under one of the following four message types:

**Type I** Message is unknown, the message is forwarded to a Customer Service Representative (CSR).

**Type II** Message can be answered with a standard, pre-defined response and does not require additional computer processing. Examples of such message types: compliments or common complaints that require standard responses.

**Type III** Message requires some computer processing to be answered and all the information IntelliServe needs is included in the message. Examples of such message types: a customer requests credit to his United Airlines mileage account number.

Information extraction techniques are used to isolate the critical information from the message; relevant databases are then looked up, and a reply based on a specific template is composed and sent to the customer.

**Type IV** Message requires some computer processing and does not contain all the information needed to process and respond. Examples of such message types: a customer asks for a group discount without identifying his group number; or a customer requests a mileage credit without identifying his mileage account number.

In this case, it is necessary for IntelliServe to engage in a "conversation" with the customer to collect the missing data. *Conversation management* techniques are used to facilitate different types of conversations; a template-based reply is composed and sent when the necessary information is provided.

IntelliServe's architecture (figure 1) accounts for all four types of messages.

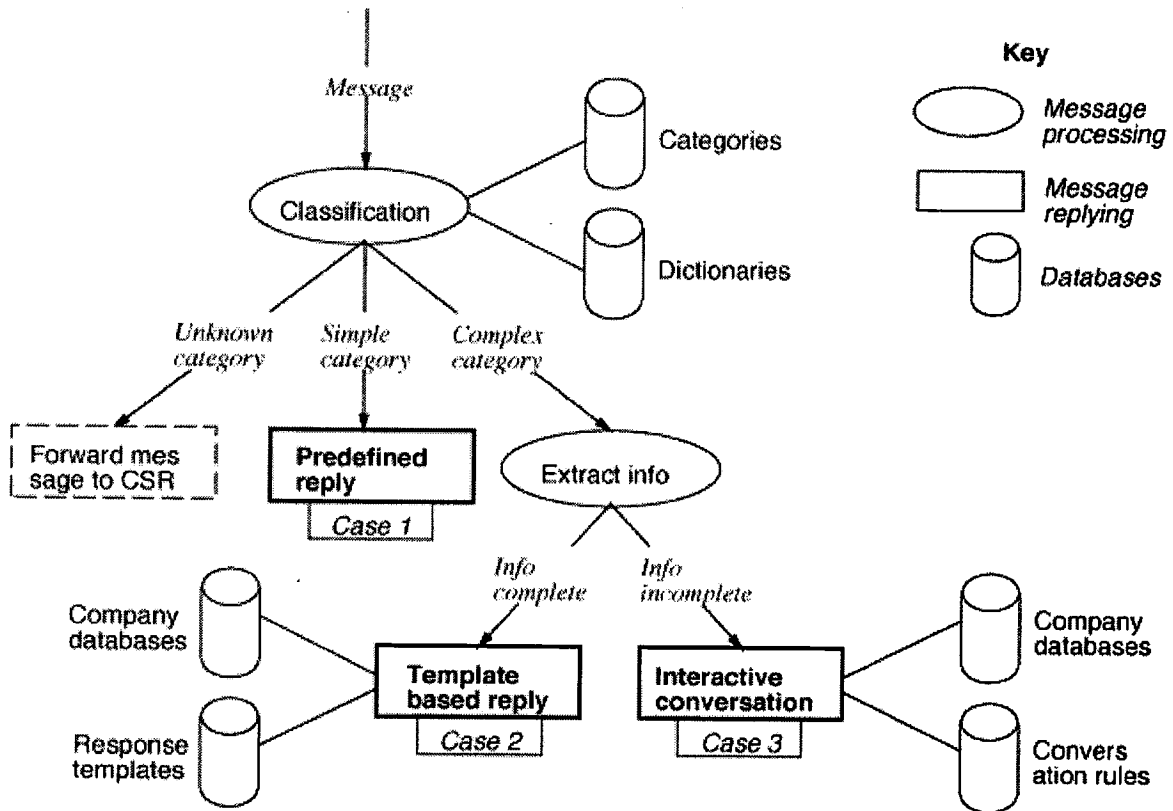


Figure 1. IntelliServe's Architecture

The incoming four message types are classified into one of the following three predefined categories; the category of the message dictates what happens next.

1. **Unknown Category:** If the category is unknown, the message is forwarded to a Customer Service Representative (Type I).
2. **Simple Category:** If the message belongs to a “simple” category, a pre-defined reply is sent (Type II).
3. **Complex Category:** If the message belongs to a “complex” category, for which no pre-defined reply is adequate, IntelliServe attempts to retrieve the necessary information from the message.
  - **Info complete:** If the retrieval is successful, a template-based reply is sent after the corresponding processing has been completed (Type III).
  - **Info incomplete:** If retrieval is not successful, a conversation is started with the customer to retrieve the missing information (Type IV).

## Message Classification Technology

By examining a large quantity of customer responses from Florists' Transworld Delivery web site at [www.ftd.com](http://www.ftd.com), Novator Systems discovered that comments can be either general or specific. General comments, such as compliments, are those that can be expressed in a wide variety of words and phrases. On the contrary, specific comments, such as when a customer asks for his United Airlines mileage account to be credited, concern precise topics and often contain specific keywords. It also appears that specific comments are less common than general ones.

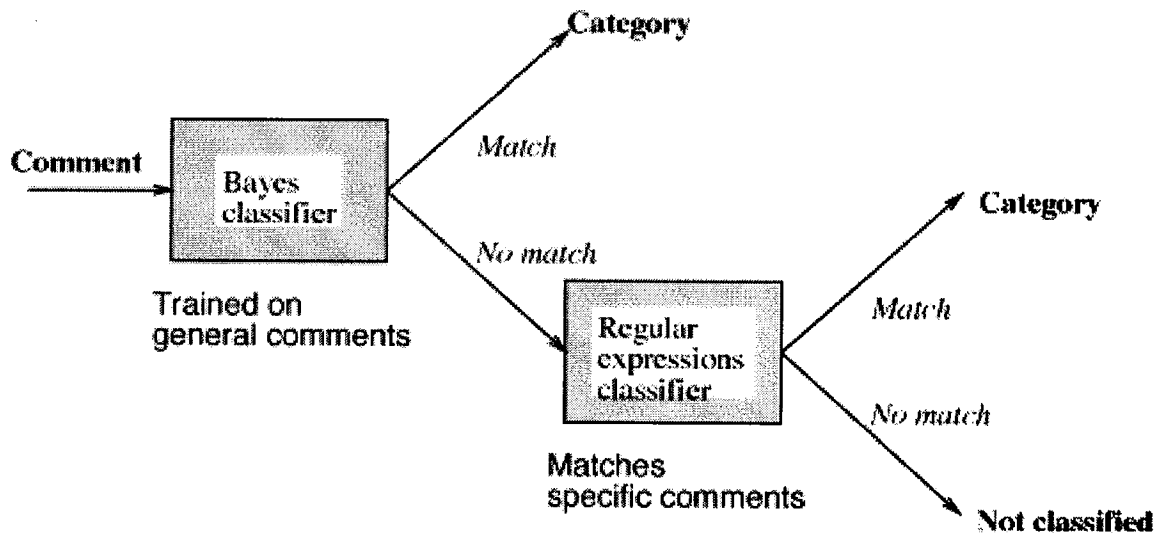


Figure 2: IntelliServe's Classifier Architecture

How the data is shaped (lots of general comments, few specific comments) prompted the two-level classifier architecture we are currently using (figure 2). We use two types of technologies:

**Bayes classifier.** This classifier builds a probabilistic model of each message category. Each probabilistic model identifies which words are likely to be present in messages of that category. The classifier must be trained on a large collection of messages previously classified by a person. It is well adapted for general comments that can contain a wide variety of words.

**Set of regular expressions.** Regular expressions detect patterns in the message. They are more powerful than keywords, as they can take into account word order, word combinations, and synonyms. The user can design one or more regular expressions for chosen categories. Regular expressions are well adapted for specific comments that tend to be expressed in a limited number of ways.

The Bayes classifier returns a confidence rate that can be set so that no more than 3% of the results are false positives (wrong classifications), whereas regular expressions do not

offer such a safety mechanism. Moreover, the Bayes classifier can identify a larger number of messages than regular expressions. This leads to our classification architecture, by which we try to classify a comment using Bayes first, and if it fails, we use regular expressions.

### **WWW-Based Interface**

Novator Systems has developed a World Wide Web-based interface to IntelliServe (figure 3) that lets the user set up the system, establish customer response categories and evaluate the system's performance.

IntelliServe lets the user define and edit the following information:

- List of categories recognized by the system
- Automatic responses corresponding the specific categories
- Regular expressions (filters) that are used in the system
- Document collections (set of comments labelled by the user to train the Bayes classifier).

The interface also lets the user train the Bayes classifier. The user only has to specify a training document collection, and the maximum rate of admissible false positives (by default 3%).

Comments (individually or in files) can be classified using IntelliServe's interface. Finally, the user can evaluate the quality of the classification (by agreeing or disagreeing with the classification of a set of comments). The interface has a built-in contextual help system that gives more information to the user regarding what each menu option offers.

## WWW-Based Interface

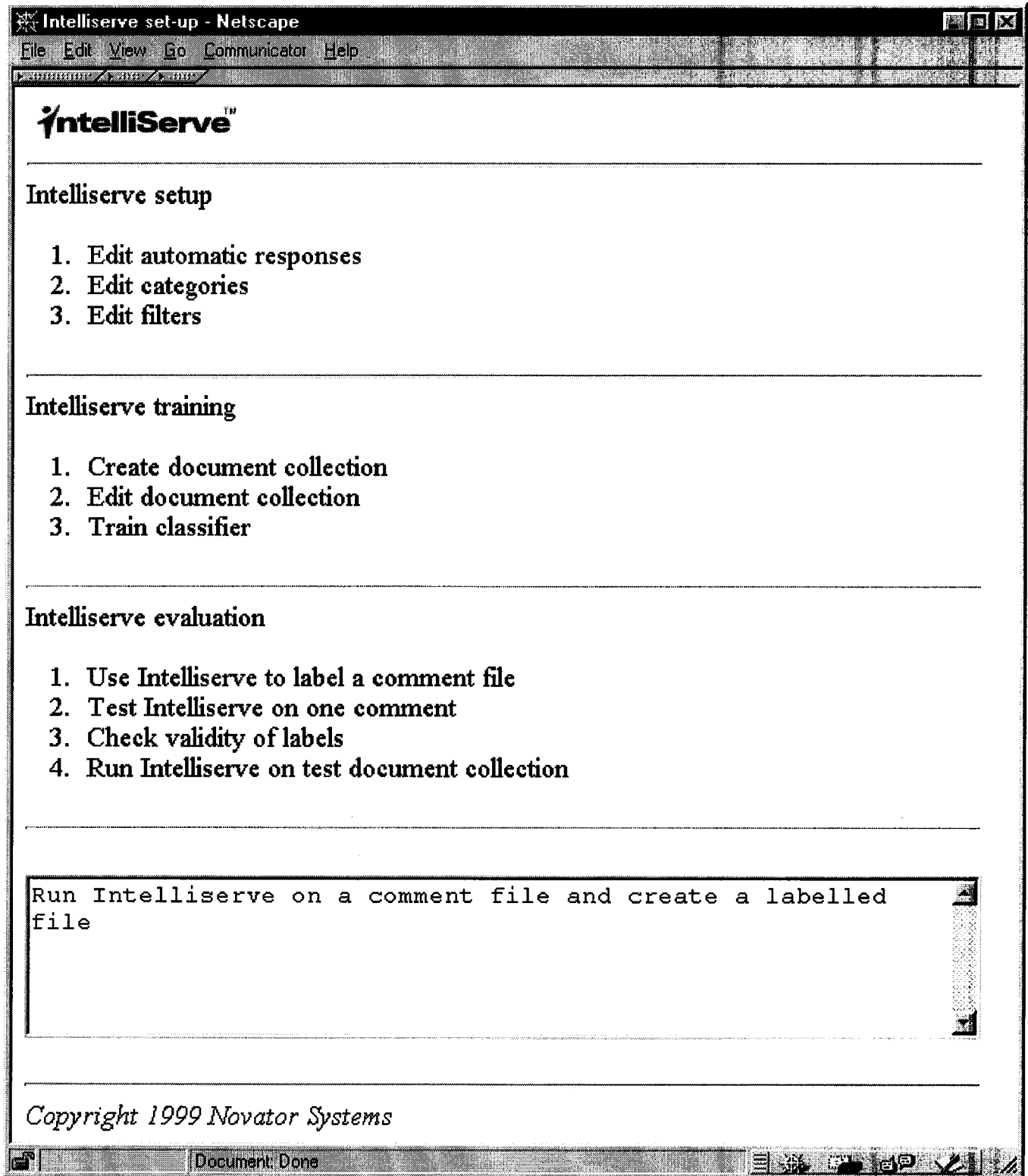


Figure 3: IntelliServe WWW-based Interface

## Case Study

### IntelliServe & FTD

A beta version of IntelliServe is currently being tested within the Florists' Transworld Delivery web site at [www.ftd.com](http://www.ftd.com). In Phase One of the project, we have implemented the classification and predefined reply modules to respond to comments made by customers on FTD's online order form. IntelliServe has reduced the need for customer service intervention by 65%.

### Customer support at FTD

Like most busy call centers, FTD's representatives respond to thousands of customer service calls and e-mail messages daily. FTD's online customers account for nearly 50% of FTD Direct's business. Customers can submit e-mail messages to FTD using a general e-mail box, an order inquiry form and by entering comments in the suggestion field of the order form. On the order form alone, over 10% of all FTD customers enter comments of some kind.

Currently, each order form is read by a customer service representative to determine if comments entered into the suggestion field require a response. Because FTD is committed to providing prompt and thoughtful responses to its customers, this can be a labor-intensive activity, particularly during peak holiday seasons when thousands of internet orders are received daily.

To reduce costs and deliver *immediate, consistent and relevant* responses to every customer, we offered FTD a solution.

### IntelliServe results

Automating customer service responses dramatically reduces the need for customer service intervention: IntelliServe currently classifies over 65% of the messages received on the order form, in one of 30 different categories with an accuracy of 97%. About 87% of these classified suggestions fall into a "simple" category. IntelliServe answers them by writing a pre-defined message on the order confirmation form, a form that is shown to the customer after the order has been recorded (figure 4). Table 1 provides some examples of message categories and their corresponding pre-defined replies.

Order flowers for Easter GO!

ftd.com

SHOPPING ▶

SEARCH ▶

GREAT IDEAS ▶

MY ACCOUNT ▶

HELP ▶

CONTACT US ▶

News & Views ▶

Business Services ▶

Order Inquiries ▶

Calendar ▶

Looking for a florist? Shop online for local services and products.

GO!

Enter zip/postal code Search by city

express lane

GO!

Enter item number from catalog

TOP OF PAGE

## Order Confirmation

**Thank you for your order.  
The total cost of your purchase is \$38.45  
This amount includes local taxes.**

**You will receive an email confirmation with an itemized total of your purchase within 24 hours. If there are any problems with the order you will be contacted by FTD Direct. If you have any questions, you may send email to [ftddret@ftd.com](mailto:ftddret@ftd.com) or call 1-800-736-3333. Make sure you include your order number listed below in your correspondence.**

### You have suggested:

**It would be nice to have more quotes to choose from in your sentiments library.**

### IntelliServe™'s automated response:

**We appreciate your comments. Each month we add new gift card messages to our growing library of Quotable Sentiments(sm). Look for Recent Additions.**

**IntelliServe™**

**Automated customer service powered by Novator Systems.**

Figure 4: FTD order confirmation page with IntelliServe response (shaded area)



Please confirm delivery	We appreciate your comments. At this time, we do not automatically confirm delivery of orders. If you have concerns about your order, please complete our <u>Order Inquiries Form</u> .
Compliment	Thank you for telling us know what you think about our site. At <u>www.ftd.com</u> , we're committed to providing our customers with the easiest and most convenient way to shop for flowers and gifts. Your feedback makes this possible. If you'd like to receive updates about new products, services or content at FTD.com, <u>sign up for FTD News</u> , our online newsletter.
Lower prices	We appreciate your comments. FTD makes every effort to keep our online prices competitive and to offer fresh beautiful flowers at market value. In a recent review, we found that our prices for the same and similar products were less than or equal to those of our major competitors on the Web.
Message box is too short	We appreciate your comments. Our florists' gift cards are not much larger than a standard business card. Your message will be hand-written on this card. For this reason, we need to limit the number of characters in your message. The next time you visit our site, you may try our <u>Quotable Sentiments(sm) library</u> for a message that will easily fit on the gift card.

Table 1: Examples of Type II categories and corresponding replies on the FTD website. Underlined text denotes a web link.

**Conclusion: Value to FTD & the consumer**

Providing customers with immediate feedback and responding to their concerns and interests builds confidence in FTD and demonstrates that the company cares about its customers. At the same time, customer service representatives are spared unnecessary order "scrubbing" and time is dramatically reduced responding to customer e-mail. Moreover, IntelliServe keeps statistics on the number of suggestions in each category and their evolution, providing FTD with valuable customer feedback in a summarized and easy to understand form.